THE
ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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ELECTRICAL ACCIDENTS IN MINES.

THE latest Blue-book on "Mines and Quarries" by the Chief Inspector of Mines, recently issued by the Home Office, contains a short report by H.M. Electrical Inspector of Mines dealing with the application of electricity, and a brief review of the accidents resulting therefrom during the year 1910. The latter were dealt with in some detail in our columns a few weeks ago from the reports of H.M. District Inspectors of Mines, as far as the information contained therein would allow, but none of the reports—considering the very great importance of electricity in mines, and the necessity of bringing before both manufacturers and mine managers, the weak points in installations and defects in apparatus—are so full of detail as they might be. Certainly some accidents are very fully described, but the descriptions would have been very much improved had they been accompanied by explanatory diagrams and sketches.

As regards the installation of electricity, Mr. Nelson states that there are no means of determining what increase or decrease in the aggregate horse-power of electric motors has been made during the year, as under the existing rules only notice that electricity has been introduced is required to be given, without any particulars of the plant installed. This omission, however, is provided for in the new Coal Mines Bill now before Parliament. It is very satisfactory to note, however, that in spite of all the objections that have been raised against it, no fewer than 40 collieries newly introduced electrical plant during the year 1910. It would certainly have been of interest as showing the trend of modern mining practice if particulars of the plant so installed could have been given in the report.

There were 21 fatal accidents in coal mines resulting in the same number of deaths, but no fatal accidents due to the use of electricity in metalliferous mines were reported. Of the above 21 accidents, 20 were due to electric hock ands one to suffocation as a result of an underground fire, but not a single case of fatal ignition of fire-damp caused by electricity occurred throughout the year. In 1909, 15 fatal accidents caused 23 deaths, so that though there are two fewer deaths for the year 1910 it is to be regretted that there are six more accidents.

As regards the underground fire, which might have had serious consequences, Mr. Nelson says: "On June 17th, a road repairer at the Devon Colliery . . . was suffocated by the smoke and fumes from a fire which is thought to have originated in an oil-filled motor controller. No one was present at the time the fire started, but from the evidence given at the fatal accident inquiry this occurred in a pump room containing a 70-H.P. motor-driven three-throw pump . . . and consequently when the fire was

extinguished the motor controller alone of the electrical apparatus was found to be seriously burnt. There was no lamp in the pump room, and no possible source of fire apart from the electrical apparatus. Some failure of the latter was, therefore, not unjustifiably assumed. The pump room contained a good deal of timber, and smoke from this and from burning cable covering was carried in-bye.

"In the year 1909 a very similar fatal accident occurred at the Blaenant Colliery, in South Wales, and a number of fires have occurred unattended by fatal results, all indicating the desirability of avoiding the use of inflammable material, such as timber, in the construction of motor-rooms below ground; unless, as an *alternative*, the electrical apparatus is itself so constructed and worked as completely to remove the risk of fire. Where neither condition is fulfilled there is the need for *constant attendance during the working of the plant.*" The italics are ours, and we are sorry to note that an authority like H.M. Inspector should even suggest there should be an *alternative* to electrical apparatus being "so constructed, and worked as completely to remove the risk of fire." There ought to be absolutely no question about this, as under no circumstances should any electrical apparatus be allowed either above or below ground that is not so constructed and capable of being operated without the slightest risk of fire. It is certainly not enough to rely upon "*constant attendance*," as it is the failure of the "human element" that is the cause of probably most of the accidents in mines, and evidently in the case quoted the pump and motor were running without anyone in charge; beyond a man occasionally calling at the pump room for the purpose of inspection and oiling, no attendance is required, as a permanent attendant would have nothing whatever to do, and the probability is—as he would possibly be neither highly intelligent nor well paid—that he would either get into mischief or neglect to do something at the critical moment. No; there must be no "constant attendance" in lieu of proper fire-proof apparatus. In addition to the fire at Devon Colliery, three other underground fires were reported during the year. In one "a set of full tubs knocked over a timber structure supporting a cable junction box, drawing the cables out of the box and causing a 'short.' The arc fired the timber which had been supporting the box, and burned the insulation at the ends of the cables." The other two were very similar, and "in each case a cable fused at or near the entrance to a pump room, setting fire to the adjacent timber. The second fire was the more serious of the two, and the colliery rescue brigade had to be requisitioned to subdue it. In each case the fire is thought to have originated at a place where there was no protective metallic covering surrounding the cables. Without such a covering, efficiently earthed, arcing from a fault may continue for some time before causing the means provided for opening the circuit in case of a fault to operate, and there can be little doubt that such arcing caused the fire in each case." These are very serious occurrences, and it is rather unfortunate that the cause of the cables fusing is not given. It is in such cases as these that a detailed description, with explanatory sketches, would provide useful information for the colliery manager and manufacturer, as showing them clearly what to avoid.

As regards accidents from electric shock, 4 of these took place on the surface and 16 underground. Of the former all occurred with three-phase current, three on "medium" pressure, and one on "high" pressure current. Three of the accidents were due to the deceased men not taking the very obvious precaution of switching off the current before carrying out their duties of oiling or adjusting machinery. The remaining accident was due to "the breaking of an insulator on an overhead line, which allowed a live medium-pressure wire to make contact with a steel stay wire." Mr. Nelson says: "It may, I think, be justly held that, with the exception of the accident last described, each of the above accidents is attributable mainly to neglect of ordinary precautions, qualified most likely by lack of appreciation of the danger of an electric shock. The accident to which the victim cannot be held to have contributed in any way would, no doubt, have been avoided had the stay wire not been secured to the top of the derrick in the neighbourhood of the live wires, or had the stay wire been connected to an earth wire. The accident illustrates a risk which I believe to be fairly common, and I would venture, therefore, particularly to call the attention of mine managers to it."

Of the 16 underground accidents, two occurred on low-pressure three-phase current systems; seven on medium-pressure three-phase; five on medium-pressure direct-current systems; and two on high-pressure three-phase systems, and they are summarised as follows:—

Absence of, or inefficient, earth connection	6
Defective insulation of cable system	6
Contact with uninsulated live parts	3
Misadventure	1

The last-mentioned accident was one where a haulage lad is supposed to have been probing with a piece of wire amongst the live terminals of an unenclosed terminal box. We can scarcely agree with Mr. Nelson that the accident was one of "misadventure," for, as we have already pointed out, in the articles alluded to above, the terminals ought to have been fully enclosed. It is the sort of "misadventure" that might be expected from a boy with a lighted candle and a barrel of gunpowder. Mr. Nelson goes on to say:—"Of the remaining 15 accidents, not one can be regarded as in the circumstances altogether unavoidable;" with proper care and the exercise of a small amount of common sense in the construction and administration of the installation, most, if not all, of the accidents would have been prevented. This, as we have over and over again pointed out, is due mainly to the employment of persons to install and look after electrical plant who are hopelessly incompetent to do so, and we are glad to note that Mr. Nelson fully confirms this, though very indirectly. He says:—"The admission that much of the electrical plant in use below ground is not by any means all it might be is quite commonly made by those well qualified to offer an opinion, and I agree with that view; but that those accidents which occur are thereby explained does not, as is frequently assumed to be the case, immediately follow. Though it is probable that something remains to be done in replacing plant which is actively or potentially dangerous from the point of view of the risk of electric shock, *it is certain that there is much more to be done in improving the standard of upkeep of electrical plant below ground.*" Mr. Nelson also admits that a great "proportion of the accidents might have been avoided by systematic and thorough maintenance of the various plants," and he goes on to blame more or less the colliery electricians for not being more attentive to their duties. This is not fair, as Mr. Nelson must know that at many collieries the electrician (so called) is wholly incompetent for the duties, or is run off his feet by attending to little complaints and faults in signalling, lighting and power systems, and in addition has no real responsibility, but is merely a "repairer" who is supposed to understand electricity much in the same way as a "watch-maker" cleans or repairs a watch. This is the sort of thing that ought to be remedied, by dividing the responsibility now held by the colliery manager with a trained and certificated engineer, who shall be responsible for the whole of the mechanical and electrical plant. Failing this, let the manager be guided by some consulting engineer who has had colliery underground experience, and who can select a good man to work under him. We would enlist Mr. Nelson's services to secure this very much desired end.

L.C.C. Loans for Electricity and other Purposes.

We print elsewhere the salient details of an extremely interesting report which has been prepared and submitted by the Finance Committee of the London County Council.

In a recent address to the members of the Institute of Bankers, the President stated that the position of bankers with regard to advances, whether by loan or overdraft, to municipal authorities and other local bodies, was not satisfactory unless the borrower had obtained the sanction of the L.G.B. and such other statutory sanction as was required, a statement which would appear to be somewhat too obvious to be necessary.

Municipal authorities, as we know, have no capital and principally employ borrowed funds, the borrowing of which is subject to very rigid supervision by the L.G.B., whose sanction is usually necessary, and the application of the money must be strictly confined to the purposes for which it is borrowed.

The unsatisfactory position in question appears to have its origin in connection with those local authorities which sometimes apply to bankers for loans or overdrafts in anticipation of their income.

To overcome such a difficulty the Municipal Corporations Temporary Borrowings Bill was introduced in the last session of Parliament, but some of the clauses in it do not seem to be regarded with approval.

Why should not bankers adopt the practice of the L.C.C. Finance Committee, which is apparently more wideawake than they? Perhaps the reason is that bankers, who are usually credited with being well able to look to their interests in matters of finance, are too keen to make short-dated loans or advances to municipal authorities. A large proportion of the money which our great banks owe to the public such as on deposit and current account, and which they feel they can safely invest, finds an outlet in loans and other forms of investment at call or short notice in which fear of loss of capital is extremely remote. The reason for this course is that it is necessary for the banks to retain such money in a much more liquid state than that representing the paid-up capital of their own shareholders and their reserves, and it is invested in first-class securities.

No application for loan, or advances, is dealt with by the L.C.C. Finance Committee unless the borough council has statutory authority to incur the expenditure in question and to borrow to defray the same, and the L.C.C. does not advance loans of a smaller amount than £1,000 except when the loan is required for the purpose of completing any work for which a loan has been previously granted, or when there are exceptional reasons which justify a loan of a smaller amount.

French Lamp Taxes.

It would seem that taxes on lamps are to become very popular among Ministers of Finance, M. Klotz (France) being the latest advocate of the peculiar view that artificial lighting is a "luxury." Acting on this supposition, he now proposes to wipe out some of the enormous Budget deficiency of 170 millions of francs by the imposition of the following taxes:—

1. 0·005 fr. per KW.-hour on electrical energy and 0·01 fr. per cb. metre on gas used for lighting and heating (electrical energy or gas used for public and vehicle lighting, or for heating furnaces or other industrial applications, being exempt). Acetylene is to be taxed by a duty of 4 fr. per 100 kg. on calcium carbide.

2. Incandescent filament lamps are to be taxed according to the following schedule:—

	Carbon.	*Metallic.*
Up to 10 watts ...	5 centimes	10 centimes
From 11 to 60 watts ...	5 "	15 "
61—100 " ...	10 "	30 "
101—200 " ...	15 "	50 "
201—300 " ...	25 "	70 "
301—400 " ...	35 "	90 "

Incandescent vapour or gas tubes will pay a tax of 3 fr. per metre of length (a basis which will obviously favour the high-voltage mercury lamp, this having the highest C.P. per unit length among this class of lamp). Arc lamp carbons are to pay 20 centimes per kg.

M. Klotz claims, as his precedent, the taxes on lamps and lighting accessories already enforced in Spain, Italy and Germany, and points out that candles and petroleum oil already pay taxes in France. But, as *L'Industrie Electrique* so pertinently remarks, the tax on candles was imposed after the war of 1870, and was announced as "exceptional and temporary," so that the justification for the new taxes is largely based on imposts which are themselves illegal and unjust.

On every hand the French technical Press raised a storm of protest against the prevalent corruption, incompetence and maladministration in Government departments, and suggested that the required funds had better be raised by setting the State officialdom in order, rather than by taxing something which is as universally essential and free by rights as water and air. Whatever the issue, the industry does not intend to allow itself to be *égorgé sans crier!*

The I.E.E. Articles.

Elsewhere in this issue we give a full report of the proceedings at the second "informal meeting" of the Institution on Thursday last week. It will be seen that a much calmer tone prevailed than at the first meeting, and there can be no doubt that the hostile spirit evinced on that occasion was very largely due not to the nature of the proposals put forward, but to the short notice given. The Council has made ample amends; not only is the final decision relegated to the distant future, but further informal meetings will be held if necessary, and in the meantime the President and some members of the Council are paying visits to the provincial centres, to meet the members of the Local Sections and to discuss the new Articles with them in person.

Already we have received reports of the proceedings at some of these meetings, but in view of the large space we have given to the London meeting, we are compelled to defer their publication to our next issue. We have also received several letters, for which we cannot find room in this issue; if their length could be taken as a criterion of the intensity of feeling experienced by their authors, it would appear that the Institution had been shaken to its very foundations! Some of the points raised in these communications are of exceptional interest.

Regarding the discussion on Thursday last week, we must admit that we shared the disappointment of the President, who deplored the lack of breadth of vision displayed. Members dwelt too much upon details, instead of discussing the broad principles which underlie the Council's proposals.

The main question is whether the Institution shall be a high-and-dry scientific and technical body, of restricted dimensions and narrow scope, or whether it shall embrace the whole industry and be, in fact, an Institution of Electrical Engineering, serving the needs of every branch of our great industry, and affording assistance and protection to every person engaged in it.

Here is a magnificent opportunity; it may never occur again—and we sincerely hope that, for their own sakes and for the benefit of all associated with electricity, the members will seize it and turn it to the best advantage.

Lamp Exports and Imports.

Month by month for the past seven years the Electrical Review has published a classified return, based on official figures, showing the nature, value and distribution of British electrical trade abroad and dealing similarly with the importation of foreign electrical material into this country. We have reason to believe that the information contained in this return has proved of considerable value to the British electrical industry—indeed, the returns themselves bear witness to the enormously increased interest of the home manufacturer in the foreign and Colonial markets, as compared with a few years back.

In order still further to increase the usefulness of these monthly figures, arrangements have now been made whereby the value of the exports and imports of *(a)* glow lamps, and *(b)* arc lamps and lamp parts, will appear separately, instead of under the common heading of "Electric Lamps and Parts," as heretofore; the new arrangement commences in the October return included in this issue.

The English glow lamp industry is a rapidly growing one, but despite the large number of new factories which have been opened during the past year or two, the importation of glow lamps into this country still maintains large proportions, while our foreign and Colonial lamp trade has made but little advance so far.

It is in the hope that the extended information may be of assistance to the lamp manufacturer and others that these monthly returns, *which are exclusively published in the* Electrical Review, have been recently amplified.

ELECTRICITY SUPPLY FROM THE CONSUMER'S POINT OF VIEW.

By "K."

Having recently visited the Electrical Exhibition at Olympia, and, further, having had time to digest some of the literature annexed while there, the writer feels impelled to offer a few remarks for the consideration of the technical men as to how the consumer looks at the question of electricity supply.

One supposes that most men are in a similar position to the writer, with a house in the suburbs on the mains of one company, and with offices in town on the mains of another company; this brings one to the first point which irritates the consumer, and that is, that nothing which he buys for his office is any good at home, and *vice versa*. As a case in point, the writer noticed a very nice electric kettle about six months ago in a shop window, and after recovering from the shock of ascertaining the exorbitant price demanded, obtained one for about half that price from an electrical friend, for use in making tea at the office when no fires were on.

When the cold weather came along, and fires were again available, it struck me that it would be just as useful at home for afternoon tea in the drawing room, so after carefully explaining the procedure to the domestic, I left it in her care.

Result, an urgent telephone call that the kettle had "exploded," and no light at home on my return in the evening. My electrical friend, after charging me 8s. 6d. for repairs to the kettle, explained that it was due to the different voltage, which also explains, one supposes, why a lamp which is quite happy in my office, treats one to a flash of lightning at home and then expires. Another point which is excessively irritating is that, having discovered some interesting and useful piece of apparatus, such as the aforesaid kettle, and saved up sufficient money to buy it, one suddenly finds one's bill for electric light leap up to an enormous sum, and after wild expostulations with the company, one finds that one can have electricity for anything but lighting apparently at about a quarter of the cost for lighting, if one will only have the place rewired at a cost of about £8, and the hire of a second meter.

I have vainly endeavoured to discover why I may boil my kettle for 1d. a unit, while I must pay 5½d. a unit for my light.

A suave gentleman from the company tried to convince me that it was something to do with when I used the kettle, but as I pointed out to him that I usually wanted the light in the office about tea time, which was when I wanted to boil the kettle, he smiled and said, "Yes, of course," and went off.

Apparently if I liked I could have my electricity for 1d. during the morning, and this I can quite believe, as when we get a fog, the kind of light the company is good enough to let us have is merely a further electrical exasperation.

The worst mode of irritation is the hobby which the companies have of making you rewire your premises.

I remember about three years ago, shortly after the offices had been wired and redecorated, a breathless young man calling to explain why my account was so viciously high. After a long tirade about the Meteorological department's returns showing that it had been the darkest January for 40 years, he proposed that I should have all the fittings altered so that I could use some new lamps in pairs, and add a lot of points to bring the total number even. He estimated this at "about 2s. a point." I had it done, and having originally had 43 lamps in all, some in three-light fittings, I acquired 58 lamp points at a cost of £8 11s. 6d., and then had to pay 2s. 3d. each for his new pet lamps, which were vile. My bill, including renewals, was much higher next corresponding quarter, and this year I have had to rewire again so as to utilise a new lamp *singly*, which I was assured would be impossible three years ago!

And all this without reference to extra wires for my kettle and a radiator, which cost me £3 10s. to install, apart from the kettle and radiator.

Another hobby of the company's is meters. My offices extend over four houses, and they originally wanted me to have, *and pay for*, four meters, but on my refusal consented to supply me in two places, each extreme flat, and only charge me for two meters, while I had to pay for the joining up of the other two circuits. I now have four meters, two for lighting and two for my kettle and radiator, which happen to be used at opposite ends of the building.

I have no doubt all these plaints seem very feeble to the technical man, but when I realise that I might have accepted the gas company's offer to lay new pipes to all my 18 rooms for lighting and fires for nothing, and give me one service through one meter for the whole lot, with 25 per cent. discount because of the stoves, and charge me—I think it was 1s. 6d. per quarter per room to look after the whole lot—I wonder whether I am not a bigger fool than I look!

But why do electricity supply companies do these things?

PROCEEDINGS OF INSTITUTIONS.

The Institution of Electrical Engineers.

Special Informal Meeting.

On Thursday of last week an adjourned informal meeting of the Corporate Members was held to consider further the proposed new Articles of Association. Mr. S. Z. de Ferranti occupied the chair, and there was a large attendance of members.

The President said they hoped to have the benefit of the expression of opinion of those members particularly who had no chance of speaking at the last informal meeting. They would like to have as general views as they could get. After the members had spoken, he believed there were some members of the Council who would like to say something with regard to the Articles. They had had suggestions coming from all directions, and he would read them out:—

Article 9.—"Only Members and Associate Members to use official abbreviations."

Article 12.—"That the Council be empowered to admit in special cases Members under the age of 30." "That Members be designated Fellows (F.I.E.E.)." "That only two electrical (Science) Members (Article 12 c) be elected each year." "That the 100 non-technical Members (Article 12 d) be omitted." "That service in law or science be omitted from this class."

Article 13.—"That all existing Associate Members be transferred and designated Members (M.I.E.E.)." "That it should be compulsory (instead of permissive) for the Council to require Associate Members to pass an examination." "That all existing Associate Members be made to sit for an examination." He (the chairman) was sure he would fail—but he was not an Associate Member. They had not included those who had sent in expressions of approval of what the Council had done.

Article 14.—"That Associates be termed 'Affiliated Members.'" "That the definition of Associate include the words 'although not eligible as a Member or Associate Member.'"

Article 15.—"That Licentiates be omitted." "That Licentiates be termed 'Subscribers,' 'Graduates,' 'Probationers' or 'Students.'" "That Licentiates be called 'Graduates' or 'Students,' and Students be allowed to remain Students as long as they wish; and that the subscription of Students be increased to 2 guineas at the age of 26 and 3 guineas at the age of 28."

Article 19.—"Elections to be abolished or made more effective."

Article 20.—"That the signatures of one M.I.E.E. and two other Corporate Members be sufficient. (The same to apply to transfer from Students to Licentiates, Article 23.)" "That candidates residing abroad be given no special facilities in regard to signatures on their election forms."

Article 27.—"That this proposal be subjected to the decision of the whole of the Members by means of a referendum." "That country members residing more than 30 miles from London or a Local Centre pay a lower subscription." "The subscription of Licentiates should, after the age of 30, be the same as that of Associate Members," and "The age of 19 seems rather low for a Student's subscription to be increased." "That subscriptions be as follows:—Inside 50 miles' radius from London: Members, 4 guineas; Associate Members, 3 guineas; Associates, 3 guineas. Outside 50 miles' radius from London: Members, 3 guineas; Associate Members, 2½ guineas; Associates, 2½ guineas." "That the subscriptions be as follows:—Within 30 miles' radius from London: Members, 4 guineas; Associate Members, 3 guineas; Associates, 3 guineas; Probationers, 2½ guineas; Students, 1½ guineas. Outside 30 miles' radius from London: Members, 3 guineas; Associate Members, 2½ guineas; Associates, 2½ guineas; Probationers, 2 guineas; Students, 1¼ guineas." "That subscriptions of existing members be not increased." "That subscriptions of new members elected after July 1st, 1912, or transferred after July 1st, 1913, be according to the new schedule in the case of London members, and that members living more than 20 miles from the Institution building continue to pay at present rates."

Article 30th.—"That members elected between October and December be excused from paying the subscription for the current year."

Article 33 (Life Compositions).—"That a graduated system according to age be adopted." "That the life composition fee be fixed at 50 guineas assuming an annual subscription of 4 guineas."

Article 42 (Professional Conduct).—Add "He should not in any report likely to be published or advertised or generally circulated describe himself in connection with the Institution as an Officer or Member of Council of the Institution or otherwise than as a Member thereof." "Omit the words 'or shareholder in' and 'or have any financial interest in such business' in Article 42 (E)." "Omit the word 'improperly' in 42 (E)." "The words 'improperly solicit' to be explained in 42 (E)." The suggestions which had been sent up showed the broad way in which people had been looking at these matters, and he would remind the members that in this question of professional conduct the Council had endeavoured to follow the older body, viz., the Civils, who had been into the thing at very great length.

Article 48.—"That the Honorary Treasurer serve not more than 3 years in succession."

Article 49.—(Ordinary Members of Council).—To consist of 12 Members, 4 Associate Members, and 2 Affiliated Members (Associates).—"To consist of 18 Members, 3 Associate Members and 3 Associates." "10 Members, 6 Associate Members and 2 Associates." "That non-Corporate Members be not represented on the Council; but if so represented, the numbers to be 4 Associate Members and 2 Associates."

Article 51.—(Nomination of Members of Council).—To be made by 10 M.I.E.E. instead of 25 Corporate Members." "To be made by 12 Corporate Members instead of 25."

Articles 51 and 52.—"That the election of Council remain as at present, except that the list of the Council's own proposals be sent out to each Corporate Member six weeks before the Annual General Meeting inviting further nominations within three weeks."

Article 55 (Powers of the Council).—"That the management of the property and funds of the Institution be left as in existing Article 68."

Article 57 (Votes of Past Presidents).—"The word 'present' in line 5 should be deleted."

Article 60.—"That the reports of Committees be received by the Council before any definite action is taken." "In line 3 of Article 60 insert after the word 'Committee' the words 'chosen from their own.'"

Article 64 (Pensions).—"That a tabulated scale depending on the length of service and amount of remuneration during that service be included in the Article."

Articles 66 and 69.—"That the powers of the Council be subject to the sanction of two extraordinary general meetings."

Article 69 (Incorporation of other Societies).—"To be permissible only by special resolution of the Corporate Members, of which 21 days' notice is to be given."

Article 79 (Alteration of Articles).—Add "But no resolution for this purpose shall be deemed to have been passed unless approved by two-thirds of the Corporate Members of the Institution."

Article 83.—"That the Local Sections be abolished in view of the small attendances at their meetings and their tendency to develop into a sort of drivel or trade-union aspect."

Article 86.—Add "If any paper has not been published in full by the Institution within 12 months of its acceptance, the author shall be at liberty to publish it elsewhere."

Benevolent Fund.—"That sufficient power be taken for the complete handling of the Benevolent Fund by the Institution."

Library.—"That it should be opened in the evenings." They would remember that that was one of the things that had been suggested, but that, of course, meant more expense. Unfortunately, anything that they wanted always cost money; the things that they did not want they could get for nothing. "That they should establish a lending library," and that was a thing the Council wanted to do; but again, it was a question of money.

Postal Vote.—"That a postal ballot of Members and Associate Members be taken in regard to the admission of the 100 non-technical persons to full membership; the raising of subscriptions of existing members; and the formation of a Licentiate class, unless there is unanimity at the meeting on November 16th."

Those were all the suggestions they had received. The Members of the Council were going to attend meetings in the various local centres. On Tuesday he would be in Manchester to hear the views of the members in that part of the world; on Wednesday he would be at Birmingham; on Thursday they would have their Council meeting, and on Friday he was going to Glasgow to hear what the members there had to say. It would be seen, therefore, that they hoped to get the views of the bulk of the members of the Institution, and hear substantially all that there was to be said on the matter. He felt sure it was in all their thoughts—that they wanted to make the Institution the best success they could, and of the greatest use to the general body of members; and if they tried to regard the matter from that point of view, and to sink their own personal views in favour of anything better that came from someone else—he was sure that the meeting would bear good fruit.

Mr. A. P. Trotter said they were met that evening under different circumstances to those of the last meeting. The Council were giving the utmost facilities for discussing the matter; therefore the asperity which was perhaps visible at the last meeting should be dropped, for they were met together to see what they could do to carry through the best possible amendment for the Institution. It was impossible to govern an institution like that by means of all the members; they must have a Council, and they relied on that Council to do their very best. He had seen a good many country members since the last meeting, and as most of them were aware, it was a serious matter to increase the subscriptions of those country members who could not attend Local Sections. They had the privilege of writing some letters after their names, and they had the *Journal*, and as Mr. Hammond told them they had the dignity of belonging to an institution which could live in such a building as that in which they had now met. He did not know that that amounted to much—many of them had never seen it. He did think that one of the most important things was that the subscriptions of the local members who could not attend Local Sections should be left as they were, because he did not see what they were going to get out of it. With the London members it was different. They had settled themselves in a house three times too big for them, and not only that, but they had embellished it in a way which he found made the country members grumble. Their hon. treasurer told them at the last meeting that the expenses they had to meet were not due to the building. That was a statement not supported by detailed figures. Their President told them some of the reasons why they wanted more money, and they were very praiseworthy indeed. But a few years ago they had ample money; they were flourishing until they saddled themselves with that building, and they could then have done some of these things. He thought he was right in saying they had fairly crippled themselves, and that to do anything further they must increase their subscriptions. He did plead for the country members, to whom it would mean practically nothing. He felt very strongly regarding the new class of so-called Licentiates. A Licentiate appeared to be someone licensed to do something, and he did not see how they were going to stop a most intelligent licensed plumber from putting over his door "Licentiate Member of the Institution of Electrical Engineers." If such a class was allowed—and he did not see why they wanted him—he should not be allowed to put up such a title, or they should give him a title which he would not want to put up. He thought the suggestion to gave him the title of Subscriber was an excellent one, for that was all he would do, and all that they could ask him to do. They heard that this building was going to help them to keep up the dignity and prestige of the Institution, and so on; now they were introducing the member who could not get through an examination of any sort. Such a class of member must inevitably dilute the Society. They stood now as a learned society; as one of the scientific societies of the country. He hoped the Institution would not dilute its intellectual standard.

Mr. F. Bailey said that in the 28 years he had been a member he had seen several revisions of the Articles, and he did not remember seeing any revision which altered things so materially as this, and altered them for the worse. The old Articles of the Telegraph Engineers were designed to meet only one class of member. They were no longer confined to telegraphy, but branched off into all sorts of ramifications—transmission of power and generation of energy, and telephony and telegraphy were now all mixed under one rule. He quite appreciated, therefore, the difficulty attending the revision of the Articles. It seemed to him that this was a very timid revision, and did not appear to grasp the real problem before them, which was to make the Institution of more value to the members and make it sufficiently important to justify other members in coming in. If many of these alterations were prompted by the mere emptyness of the cash-box, he thought it very deplorable that they should have taken the form of lowering the dignity of the Institution in any way, and particularly by the introduction of the Licentiate. So far as many of the revisions were concerned, they seemed to desire to give more power to the Council; it came rather badly from them to suggest that some power be given to them to the exclusion of the right of veto on the part of the members. He disliked the whole thing so much that he was compelled to ask the Council to withdraw the matter and reconsider it. All the bad points in the old Articles had been repeated in this revision, and they were made worse by including other words. For instance, in regard to members, they read, "That he has been regularly educated as an electrical engineer." The word "regularly" had been put in. He denied, after 30 years' experience, that they could make an engineer at all by experience. They *trained* an engineer, and he ought to be educated first. The student was the only man who had been trained, and he was trained before he became a student. He was not at all clear by what authority the Council now suggested that they did not desire to come to the members for authority to borrow money on loan. Who ever heard in a limited liability company of the shareholders not being consulted before debentures were issued? In Clause 69, the Council again wished to take the whole discretion of fusing with other societies without consulting the members. Were they to allow that? They had heard no explanation at all as to what the examinations were to consist of. Was it to be a technical examination or was it to be an examination to see if the member was of good education? If it was assumed that the examination was to be a technical one, what were they going to ask him? The careers possible for any member of that Institution, so far as he could see, were about 12 in number. In which of those was the man to come in and graduate? He would propose that this revision be withdrawn absolutely, and that another committee be appointed, with wider scope and with their eyes open to the fact that the Institution was no longer for telegraph engineers only, but should be a great Institution, embracing all these 12 careers, and that for this purpose the Institution should be divided into certain heads. Members should be asked under what head they intended to devote their career. These different sections should meet and select their own committees, and let the chairmen of the sections form the Council. Each of these sections could, through their own committees, receive papers and hold meetings for discussion, and they could send their best papers to the Council for discussion by the whole Institution, and the opportunity could then be given to the younger members of the Institution to gain experience in speaking. Something was wanted to encourage the younger members to prac-

tise speaking. Many knew a great deal, but they did not care to say much. He considered the matter of such vital importance that he asked all the members to join him in asking that this revision should be withdrawn. It would be ten thousand pities if the matter was pushed on and if the members should be forced to overwhelm the Council. Referring to the proposal of the Licentiate, he must say that the Licentiate would seem to be an awful being who was perfectly illiterate. He could not pass an examination; he had no particular qualification, but he might add a few shillings to the cashbox.

The PRESIDENT said it was a great pity Mr. Bailey did not give facts. He would see that a Licentiate must be a person of good education.

MR. BAILEY said he meant he could not pass an examination.

The PRESIDENT: It is a question of keeping to facts. There are 20 things which you are incorrect about.

MR. BAILEY said he was not quoting directly from print. He asked the members seriously to put an absolute veto on this revision.

MR. W. E. WARRILOW said he would like to touch on the commercial aspect of the Institution. He suggested with regard to the new classification of members, which seemed to him to be necessary, that it be carried out under two heads—the professional and technical, and the commercial. Under the heading of technical and professional, they might have associated members and students, and under the heading of commercial they might have associates. There were many commercial men identified with the electrical industry who at present had not the opportunity of speaking or reading papers on subjects which were of vital importance to the development of the industry from the commercial point of view.

MR. A. KIRK said it seemed to him that the discussion ought to start upon the basis—was this to be an Institution of Electrical Engineers or not? At present they were not an institution of electrical engineers, and under the proposed new rules they would be still worse.

MR. E. MACGREGOR DUNCAN said that as a consulting engineer he was particularly interested in the new Article No. 42, dealing with professional conduct, and he welcomed any step that the Council might take for dealing with this matter. It might certainly be assumed that the Council had felt the need of safeguarding the public in their dealings with the consulting engineer. That this feeling existed was, he thought, generally admitted, and it was probably known to all present that steps had been taken by a number of consulting engineers to form an association for the mutual protection of the public and themselves. He could not help feeling that this Institution was the proper body to deal with that matter as far as its own members were concerned, and he suggested that the Council should consider whether it was not desirable to provide the necessary machinery so that the members affected might be at once distinguished from their fellows. Briefly, his suggestion was that all members of any class regularly practising as consulting engineers should be required to forward their names to the Council for registration as such. It was only, perhaps, those of them who had to deal with the smaller engineering works, who knew how great the present evil was, and how urgently it needed controlling with a very firm hand.

MR. J. F. C. SNELL asked to be allowed to speak, not as a member of the Council, but as one of the rank and file of the Institution. In passing, he might correct Mr. Bailey in one respect. Mr. Bailey seemed to think with regard to consulting engineers that anyone could put up a brass plate on his door for seven years and become a member of the Institution, but Mr. Bailey could hardly have read the qualification at the end of the section, which said that he must have acquired eminence in the profession. As to the Licentiates, it was the principle they had to deal with. Did the Institution want to restrict its membership of whatever class to purely professional engineers or did it not? Let them not forget that under the new proposed regulations they were going to impose certain further restrictions upon the membership of the Institution. Before they could become corporate members at all, people would be required to pass an examination, or might be required to pass an examination, and they had to pass certain other qualificatory tests; the object being, of course, that those who became Associate Members and full Members should be properly educated and properly trained electrical engineers. That of course, would entirely exclude anybody who was connected with the electrical industry, but who had some important part to play in their work either from the commercial, financial or legal sides. The class of Associate in the past had included all and sundry. It was desired, as in the case of the Institution of Civil Engineers, that the Associate in future should be a person who occupied a high position as a barrister or lawyer, or commercially or financially, and who played an important part in the control of their industry. There were many Students in their Institution who, having had a proper training, got put into positions which did not give them facilities to pass an examination as Associate Members. When they were actually engaged in practical work, they did not care to be called Students when they had reached a certain age; and yet, if they were abroad, or for other reasons, were unable to get the opportunity to pass the necessary qualificatory examination, were these people to be turned out of the Institution? They could not become Associate Members very well, and they could not remain Students. Was there any objection to providing a sort of intercalary class, in which they could be put for the time being? Whatever they called this class, the entrants must be persons of good education. He thought it would be a very great help to them if the members present could express an opinion as to whether or not they should go on in the future purely as a professional institution, leaving aside altogether the commercial and financial and legal supporters of it, or whether they were going to adopt the broader and, in his opinion, the better policy of including those gentlemen. They knew that a great many people outside, as he thought with some good reason, had complained that the Institution in the past had only looked at the purely academic and scientific side of things. If they were going to take this more catholic and more comprehensive grasp of things in the future, then he thought they would find when they came to analyse things properly that there was room for this intercalary class. If they could decide whether the principle or not should be adopted, then the question of name could be got over. He quite agreed that the name was one they did not like, and it was perhaps a name capable of misuse. Many other names had been suggested—Graduates, Subscribers, Probationers, Junior Members, Senior Students and Junior Associate Members, and he also believed Companions. None of those names were particularly good. The Institution of Mechanical Engineers adopted the term Graduate, but that was a misnomer, although it might be better than Licentiate. He thought that perhaps on the whole, Graduate might meet the position.

MR. H. PRIDEAUX said they did not like the name of Licentiate, as it seemed to give a licence to a person, and the Institution could not do that. Secondly, he did not think they wanted the class at all. With regard to the examination of the Associate Members, they ought to know a little more about it.

The PRESIDENT said it was all in the annual report.

MR. PRIDEAUX said a good many of them objected to the new Articles generally, as they gave too much power to the Council. He also thought it was unjust that after paying an entrance fee, in a couple of years a member should have his subscription raised.

MR. J. G. LORRIAN said that with regard to Clause 42, dealing with professional conduct, he would like to see a further clause to the effect that in any report a member might make, he should not describe himself as a member of the Council or an officer of the Institution. He wanted, if possible, to put a stop to certain abuses which existed some years ago, and which might easily exist again. He suggested that when members drew up reports which were likely to be advertised, they should sign themselves only Member or Associate Member. It could not be for the good of the Institution to see, after a company had failed, a report signed by a Past President or something of that kind. An Institution of which he had the honour to be a member of the Council had found it of the utmost use to have that clause.

MR. DYKES said he would like to congratulate the Committee drawing up the Articles. He had gone carefully over them and had noted the points raised and heard the arguments, and, on the whole, he was inclined to think the proposals as put forward by the Council presented the best solution that could be found. He thought they should call this new class of members Graduates and not Licentiates. With regard to the suggestion that those members who desired to practise as consulting engineers should be starred as a separate class of members, there were serious objections to that. The consulting engineers represented only a small proportion of the members, and he hoped the effect of including these rules would be that the Institution could gather together into one body those members who desired to help the profession.

MR. MADGEN said he supported the last speaker in congratulating the Committee which had dealt with this matter. He did not know that he had ever listened to such a strong indictment against any body of men as Mr. Bailey had put forward, but he was bound to say that seldom or never had he heard one in which such little care was taken to verify the references. Mr. Bailey deplored the circumstance that the new Articles did not begin by stating the reasons for their existence, but if he had taken the trouble to read the document he would have seen that the whole of that was detailed very properly, where it ought to be, in the memorandum. The memorandum of an organisation could not be changed except by permission of the Courts, and thus their memorandum stood where it did and plainly stated what their objects were, but he, for one, thought they had failed dismally in fulfilling the last Sub-Section of Clause 3, which was "To do all such other lawful things as are incidental or conducive to the attainment of the above objects"; one of these objects being "To promote the general advancement of electrical and telegraphic science and its applications." This was clearly indicated by the fact that other bodies had been formed for particular purposes. The consulting engineers did not feel that their interests had been looked after, and he believed they had actually started a separate body for the purpose of carrying out the views of that section. Then the Tramway and Light Railway Association had been formed for the purpose of looking after that section of the business, and he sincerely believed that that Institution failed in doing that work. Another body that had been formed, called the Committee for the Protection of Electrical Interests, of which he (Mr. Madgen) happened to be a member, was brought into existence because the Institution failed to have sufficient regard to the real requirements of the industry. Then again, the Institution of Mining (Electrical) Engineers was formed for the same reason, viz., that the Institution of Electrical Engineers did not devote sufficient attention to that very important branch of the business. If they wanted to make any real progress not only with the science, but with the electrical industry, they would have to reorganise the Institution on a more catholic basis. With regard to the admission of Licentiates, he thought the name "Subscriber" was better, or the name "Associate." He thought that the proposals represented a sincere and earnest attempt on the part of the Council to bring the Institution up to date in relation to the different branches of the industry, and he for one felt that he owed them a debt of gratitude for their labours.

MR. J. J. WOLFF said the Council wanted to convince them of the need or the advisability of increasing the subscription, but they

had not put forward any figures showing how they intended to spend the additional subscriptions. He thought that if the Council could give them some information on that point it would help to convince the members, and to make them agree to pay the additional subscriptions. Under the old rules an Associate Member must have had at least two years' employment in a responsible situation as an electrical engineer; in the new rules the words "in a responsible situation" had been dropped—in other words, the the Council was making it more easy to become an Associate Member than it had been in the past. He admitted that the rule was qualified by the remarks at the bottom of Article 13, "provided that the Council may require candidates to pass an examination." Was it definitely proposed that the candidate should undergo an examination?

The Chairman said that the question as to examination was dealt with as follows:—"Provided that the Council may require candidates for associate membership to pass an examination, or, in their discretion, grant exemption therefrom in approved cases."

Mr. A. J. Cridge said he would like to know precisely what the Council were going to give the members in return for the larger subscription. They had heard something of what they could do, but he would like to know what they really proposed to do. Another point he wanted to raise was, why did the Council propose to alter the method of transfer from one class to another by submitting the transferred member to a general meeting, after he had got past the Council? He thought the rule as to transfer was all right as it originally stood. Could they use the term "Bachelor" instead of Licentiate? With regard to the election of the Council, if they wished to elect a man on a borough council—quite an important body—a proposer and seconder, and eight supporters, were quite sufficient. It had always been so in their Institution, and he thought that 25 names was an excessive number. He would like to see that rule left as it was, and that 10 members should be sufficient to nominate a man for the Council. Moreover, he thought they ought still to have the privilege of making nominations after the lists had been issued. There was one other point which he would touch upon with very great respect, and that was the constitution of the Council. Why did they include the Past Presidents always? The Municipal Electrical Association, to which he belonged, did not do that. When a man had passed through his past presidentship, which lasted for three years, if he wanted to get on the Council, he went on the floor and got elected as an ordinary member. A great politician retired the other day because he felt he could not keep in touch with changing circumstances, and he submitted, with all respect, that that might apply to some of their past presidents. Referring to examinations, he thought they might take it for granted that the Council would put alternative papers up in the same as their friends the Civils did.

Mr. J. E. Kingsbury said that the criticisms that they had had upon the particular Article which referred to the subscriptions had mainly been on the lines that if there was to be any increased subscription, somebody else should pay it. The object of the increased subscription was to get more money. The position, shortly, was that more money was required for the purposes of the Institution. Mr. Trotter had referred to the fact that Mr. Mordey stated that no increased subscription would be necessary. Mr. Mordey also said that no levy on the members would be necessary; and there had not been any levy on the members, and he would remind them that Mr. Mordey spoke in 1908. A plain statement of facts and figures was put before the members by the Council. The cost of the building was £50,000, and the cost of the extensions was another £6,000. They had expended on the building and in alterations, in accordance with last year's accounts, £18,000. The total cost of the buildings, in accordance with the building fund, had been £73,000, and it would therefore be seen that they had to deal with a totally different set of figures to those contemplated in 1908. He would like to point out the great advantage which the Institution had obtained from having departed from that modest estimate that was placed before the members at the start. They had a new building of which they had reason to be proud; they could see what a terrible mistake it would have been to carry out the original proposition; they had widened the area of the theatre, and they had extended the walls, but they had done something, to his mind, far more than that—they had extended their outlook; they had a greater perception of what the Institution was, and what it could be. Before he left the question he would say that it was not entirely the buildings that needed a new subscription. The wider scope of the Institution, which was so obviously necessary, had really as much to do with the case as the building itself; but, still, the building had a great deal to do with it. They were now in the position of having their income and their expenditure so nearly balanced, that it was not a safe thing for the Institution—they needed a wider margin, and the Council considered in the propositions that had been put before them, that that larger margin should be obtained from the present subscribers. The suggestion had been made that there should be a difference, and that the country members should pay less. The example of the Civil Engineers was brought to their notice, but what were the conditions? The Civil Engineers had no Local Sections; the Electrical Engineers had Local Sections. Those who resided in the country had the idea that that building was more or less the property of the London members; that idea seemed to him not to take sufficiently into account the importance of the Institution and its need of a home. The expenditure incidental to the Local Sections was about £1,400 a year, and the rental value of the theatre and such other portions of that building as might be considered only habitable for the London members was about £1,900 a year. They would therefore see that the ordinary idea that the country member had not the facilities, and therefore should not pay as much as the London members, hardly applied to their conditions, for, as they would see, there was really very little difference between the expenditure on the Local Sections and the expenditure due to the building. There were, of course, a very small number of members who were not within the area of a Local Section and who were not within reasonable distance of London. Those members logically, were undoubtedly entitled to the benefits which were made for country members, but their number was small, and it was not possible for an Institution like theirs to have such a varied scale of rates as would ensure that every member should get value for what he paid. He would like to remind members that there was a theory governing such Institutions as theirs, and that theory was that each member was contributing to the advancement of the science. All that the Council was suggesting was that the Institution should be placed on a par with other institutions having similar aims. He would like to remind them that, of the £73,000 at which that building stood in the books, £37,000 had been contributed by members of the past. That seemed to him to be a reason why they should not put too much on to the future.

Mr. H. Hirst said that he had had some experience of what was good for technical men; it had been his lot to nurse engineers through their days of nursing, and then contact with commercialism had not in any way affected their character as scientists or strictly technical men. It had, indeed, rather been the other way. When in former years there were differences between members of the Institution and the Council, one heard words such as "clique" and "past presidents." It struck him on joining the Council that never was there such a democratic representation as they had at present. With regard to the debate, the question was whether they agreed to the principle of the new articles. It appeared to him the idea was to follow up the policy of the building, and by building he did not mean that edifice only, but the ideal of the building and what was incorporated with it. From the earliest days a building fund was in existence, which was started by those who preceded them. Did they think those people started the building fund as a mere cheap investment? He was quite sure they had no such idea. What a splendid thing it would be if they could offer hospitality to all those institutions which Mr. Madgen had mentioned, and which had formed themselves into separate bodies because they thought their interests did not receive all that care which was necessary. In doing this they could prevent the different sections doing work twice over. He did not think it was sufficiently known what the Institution had already tried to do. Since he had been on the Council he had learned that there was a commission appointed, partly by the Institution and partly by the members of trades and businesses, to study electrical driving in textile mills. Why should there not be similar committees sitting with regard to rolling mills and ship building and motor-cars and coal mining, or any industry they could think of. It might be thought an advantage if the Institution had an employment bureau. They might also with advantage put apart in that magnificent building rooms and offices for the free use of the country members and those who came from their overseas dominions. Other things had been mentioned, such as Parliamentary and other work, which the Institution might with advantage take up. If they wanted to do more work, it meant more money. More money could only be obtained by more members; more members meant more power; and more power meant more prestige, and this was after all the way to success in whatever they wanted to do. With this idea the Committee had gone to work admirably, and had fixed irrevocably and irremovably that the future of the Institution was to be secure in the hands of its corporate members. There were members of other professions who were busy all the year with electrical problems. What was wrong in asking these people to become members of the Institution as a class by themselves? When they once realised how useful that class could be, they would understand that room for them must be found.

Dr. H. Borns said that if examination had been imposed 30 or 25 years ago, it would have been right, but now there were many Universities in England and any number of excellent technical colleges. Considering this, why must they as an Institution undertake examinations, which might surely be left to the colleges? He did hope the examination idea would be done away with.

Mr. W. R. Cooper said he had raised the question of the subscriptions before he saw the tables issued by Mr. Hammond, and if he had seen those tables he did not think he would have made the suggestion. There was a very great difficulty in putting any financial question to the ballot, because they could not put all the information that the Council had before the various members. If, for instance, he received a postcard asking whether he would like his subscriptions raised or not, he replied "No," but if he had full information before him, possibly he might reply "Yes." He hoped that the Council would give as full information as possible, in order that the members might be able to judge these questions for themselves.

The Chairman said perhaps for that evening they had had enough. Some of the Council were going to meet the various Local Sections to hear what they had to say on the matter. That would be the next thing, therefore, that would take place. That was an informal meeting, and they might have another. The principal thing was that they had plenty of time; there was no particular hurry in the matter, although it did appear to some at first that the Council had reason for an unholy haste; but that was not the case. The Licentiate class had been spoken of as a new class, but it was not a new class. What was really new was the Associates who existed at present. What they wanted to see, and what they believed was for the good of the Institution, was to have an Associate class, which was an honourable one for the kind of man that they thought it would be to the Institution's advantage to have. Suppose, for example, they had a man who managed

a big business and who had a considerable knowledge of electricity, but having been brought up as a business man, and having come into electricity and simply learned it as he had come on in life, however good his knowledge might be, he would not presume to become an ordinary member of the Institution. Imagine their trying to get such a man to come into a class which had his junior assistants in the test room as members—quite young fellows who had just come away from College, and who were not old enough, or who had not got on far enough, to become Associate Members. It was not that they sought to do anything new, but at present the thing was so hopelessly inefficient that they could not hope to get the people into the Institution that they thought would be of benefit to it. It was really a process of straightening out the Associate class, which necessitated a stepping-stone class of a lower grade for the technical men between the Students and the Associate Members. He confessed that he felt disappointed with the proceedings that evening: so little consideration had been given, and so few words said on what he considered the all-important subject of the scope of the Institution. Now that their proceedings had got so much less interesting than they used to be in the past, when everything connected with the industry was new, and when it had the greatest fascination for them all, he felt they were more likely to die down in interest, and therefore in the support accorded to the Institution, and that the Institution might go down from the very high position which it occupied to-day. He thought that where they took a single subject like electrical engineering, although it was a big one, their only way was to provide an Institution to look after and to take an interest in the whole wide field of the industry, and not just the purely technical part. They had got to a point where he felt sure they would go down unless they broadened their basis. On the other hand, electrical developments and new electrical inventions were getting greater every day, and he believed they would be multiplied tenfold in the not distant future, and it did seem to him that those were interests which required looking after and fostering. Who better should do that than their Institution, if they would only put themselves into the position to do what was required? He wanted all of them to think of the matter from that point of view, and to look at the question for themselves and work out their own salvation. The success of the Institution would not be brought about by the Council forcing on any measure or overriding the members. Their object was to obtain the support and to get the views of the whole of the members, and they would have wasted their time and done no good unless they got the support of the members. It was a serious question for them to face. Were they going to continue the Institution on its old basis as a purely technical society, with a few other people who were let in by accident or for other reasons?—or were they going to broaden it out into a society which would take into it the best of science and the best of business combined, and which would look after all electrical interests? For the younger members of the profession, surely it was to their interest to be brought into touch with their markets. They were all trying to find their customers—whether it was the scientist or the manufacturer, they wanted their customer. The customer for the young man was the commercial man who developed electrical undertakings, and if the younger man had a chance of speaking and the older business man was there, how did they know where the benefit to those young men would stop? It was just their opportunity. They were not asked to have the society in any way lowered. The admission to membership was made more difficult. The Council, in his experience, for the last two years or so had been more and more strict about letting people in. They must get the best science that they possibly could, and the best business knowledge that they had, because science must live on the business that was done by it. He hoped that before they had another meeting those views might be fully considered. They were the feelings of a great many among them. The Council would notify the members when they had got a stage further.

Modern High-Voltage Power Transformers.

By WILLIAM T. TAYLOR, Member.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *London, November 9th*, 1911.)

MANUFACTURERS of transformers are now prepared to build them in units above 15,000 KW. and at 200,000 volts. One large factory is using annually about 6,000 tons of steel and about 2,000 tons of copper in the manufacture of transformers.

Commercial transformers have already been built for and are operating at voltages as high as 500,000 volts in small units of 200 KW. The author believes there will shortly be transformers in operation in testing departments at much higher voltages than even this, and also that power transformers will be built in units of 20,000 KW. at 200,000 volts.

Whenever water is available and not expensive, water-cooled transformers are preferable to air-blast transformers of large and moderate sizes (2,000 to 10,000 KW.), as it enables the operation of transformers at lower temperatures and thus allows more margin for overloads.

The fire risk of air-blast and oil-filled transformers depends as much on surrounding conditions and the location of the transformers as on their construction. The air-blast transformer contains a small amount of inflammable material compared with the oil-filled transformer, but this material is much more readily ignited. The chances of an oil-filled transformer catching fire on account of any short circuit in the windings are extremely small, as the transformer is completely submerged in oil, and no air can get to it. Moreover, the oil used in transformers is not easily ignited. The idea of placing oil-filled transformers in separate compartments is not thought so necessary now as it was some years ago.

The "all-day" efficiency is an important matter to operating engineers, and in general it is found that transformers will operate economically and quite satisfactorily when worked at their limiting temperature rise. The increase in first cost of transformers which are too large is greater than the capitalised cost of the reduced losses, and a careful study of the conditions governing the loads should be made before a final decision is taken as to the exact size to adopt for a given service. It is unwise to follow strictly a rule of choosing equal kilowatt capacity for equal generator units, although in some particular cases this will hold.

TABLE I.

	Output in kilowatts.	Load efficiencies. 100 %	75 %	50 %	25 %	Gallons of oil.	Gallons of water per min.
25 cycles.	100	95·3	95·0	94·1	90·2	200	2·0
	200	96·4	96·2	95·3	92·0	250	3·0
	500	97·3	97·4	96·9	95·4	750	5·0
	1,000	97·8	97·8	97·4	96·2	1,400	8·0
	2,000	98·3	98·3	98·0	97·1	1,800	13·5
	4,000	98·7	98·7	98·5	97·7	2,300	21·0
60 cycles.	100	95·6	95·4	94·4	90·8	100	2·0
	200	96·6	96·3	95·3	92·0	200	3·0
	500	97·3	97·0	96·3	93·5	600	5·0
	1,000	98·0	97·8	97·2	95·2	650	7·5
	2,000	98·4	98·2	97·8	96·1	1,600	12·5
	4,000	98·8	98·7	98·3	97·0	1,950	19·5

Not very long ago a transformer was designed known as the "forced-oil type," the first designs having their oil-cooling outfit external to the transformer. Modern designs of this type have their cooling coils located within the transformer tank, being separated from the main body of oil by a sheet-steel diaphragm. The heated oil is pumped from the top of the transformer and discharged into the upper part of the cooling compartment, and by continuous operation of the pump the cooled oil flows out from the bottom of the compartment and up through the spaces or ducts between the windings and the core. The forced-oil cooled transformers are used in sizes above 2,500 KW. for single-phase and 7,500 KW. for three-phase.

In Table I there is shown a class of single-phase oil-filled water-cooled transformers, for 25 and 60 cycles respectively, 66,000 to 6,600 volts, giving the efficiencies at various loads, with a maximum temperature rise of 40° C. at full load.

The regulation of the 25-cycle transformers for non-inductive load varies from 2·5 per cent. to 1·6 per cent. in sizes up to 300 KW., and to 1·2 per cent. at 4,000 KW.; while the regulation of the 60-cycle list varies under non-inductive load from 2·3 per cent. to 1·4 per cent. in sizes up to 300 KW., and to 0·90 per cent. at 4,000 KW.

The usual designs of core-type transformers made have a uniform distribution of dielectric flux between high- and low-voltage windings, except at the ends of the long cylinders, where the dielectric flux will be greater and its distribution irregular.

The "shell-type" water-cooled transformers and forced oil-cooled transformers are built in larger sizes than the core-type transformers, the former type having been built in 6,000-KW. single-phase units and 10,000-KW. three-phase units.

In a three-phase shell-type transformer constructed so as to form a single structure, the reduction of steel for the magnetic circuit amounts to from 10 to 20 per cent. of that used in three single-phase transformers placed side by side.

In this type of transformer it is difficult to insulate the large number of edges and sharp corners exposed between adjacent high and low-voltage windings and between windings and core. At these places the dielectric density is very great, and it is a much more difficult matter to insulate them than the ends of the cylinder coils of a core-type transformer. Much more insulation is required, and consequently a larger space factor. The result is lower efficiency and worse regulation, and consequently a heavier and more expensive transformer for a given output and efficiency.

Air-blast transformers are regularly built in capacities up to 4,000 KW. and for a voltage of 33,000. Their efficiency, in good designs and with the required amount of air pressure, is slightly better than that of the oil-filled water-cooled transformer of the same capacity. The general design is very much like that of the ordinary shell-type transformer, with the exception of a few modifications in the iron assembly, where certain air spaces are left open for the circulation of air. The temperature of the outgoing air compared with the temperature of the ingoing air is the best indication whether sufficient air is passing through the transformers; if there is not more than 20° C. difference, the supply of air will be found sufficient. As transformers are generally designed on the basis of 25° C., the best results are obtained when the temperature of the incoming air is not greater than this value.

Very special care and knowledge are necessary on the part of those whose duty it is to dry-out transformers, for the difficulty is not so much in drying the coils, but in drying the whole insulation surrounding them and the core. No matter for what factor of safety the transformer has been built, it avails little in the case of carelessness or neglect to dry out the transformer properly.

Before transformers leave the factory they are given a high-voltage test, the standard being to apply twice the rated voltage

between the high and low-voltage windings, the latter being connected to the iron core. It is now believed that the greatest cause of failure in high-voltage transformers arises from punctures between *turns* and not between the high and low-voltage windings.

In the air-blast transformer careful examination should be made about once a month to see that the air-circulation ducts are quite free from the accumulation of dirt and dust. In the case of oil-cooled transformers, samples of the oil should be drawn from the bottom of the tank about once a month and tested, and a record

TABLE II.—Oils for High-voltage Transformers.

	Quality (A).	*Quality (B).*
Flash-point	185° C.	129° C.
Fire test	210° C.	149° C.
Viscosity	105 seconds	39 seconds
Breakdown test	30,000 volts	40,000 volts

kept of its condition. It is desirable, for the purpose of preventing condensation on the oil surfaces and other inside transformer surfaces, to keep the oil at all times at least 10° C. above the room temperature.

The most important characteristics of transformer oil which interest the operating engineer are summed up in Table II. These values are a standard minimum for 0·2 in. gap. Quality (A) is for oil-cooled, and (B) for water-cooled transformers.

For oil-filled water-cooled transformers it is customary to use another grade of oil than that used in the self-cooled type, the oil operating at a lower average temperature, consequently a high flash-point is not of so much importance.

Usually oil is received abroad testing less than 30,000 volts per 0·2 in., but before it is placed in the transformer it is brought up to test at least 30,000 volts per 0·2 in. for transformers designed for an operating voltage of 44,000 volts and under; not less than a 44,000-volt test per 0·2 in. is required for oil used in transformers operating above 44,000 volts. The water present must not exceed 0·001 per cent. in order to obtain a dielectric strength of 40,000 volts in the standard test (0·2 in. between 0·5-in. disks).

Some people think that once a transformer has been put into successful operation it will continue to operate satisfactorily for an indefinite time without any attention. This is a wrong idea. Transformers require attention, and must be given attention, or else they will not give good service.

The efficiency of a transformer is usually considered its *most* important feature by the majority of station engineers and managers operating local distribution systems. By transmission engineers this feature is not considered to be the most important, but rather the insulation of the transformer, and consequently its reliability, next to which comes safety, then efficiency.

Many breakdowns of large power transformers have been recorded resulting from the stoppage of the cooling medium, all of which could have been saved if proper care had been shown. Hourly temperature readings are the best indications of anything wrong in this direction. In case the circulation has been stopped by any cause, the transformer may be operated until the coils at the top of the transformer, in the case of an air-blast, or the oil, in the case of a water-cooled transformer, reach an actual temperature of 80° C. This temperature limit, under ordinary conditions, will permit the transformer to continue delivering power for about three hours; a very close watch must be kept of the temperature, and the transformer must be taken out of service as soon as it reaches this limit.

TABLE III.—Modern High-Voltage Power Transformers operating above 62,000 Volts.

Systems.	Kilowatt capacity.	Voltage of line.	Connection of system.	Phase φ*
Stanislaus Power Co. ...	3,750	138,500	Star	1
	2,233	104,000	Star	1
Great Western Power Co.	10,000	110,000	Delta	3
	5,000	90,000	Delta	1
Grand Rapids Michigan Power Co.	3,750	110,000	Delta	3
Hydro-Electric Commission	1,250	110,000	Delta	1
Great Falls Power Co. ...	1,200	102,000	Delta	1
Central Colorado Power Co.	3,330	100,000	Delta	1
Southern Power Co.	3,000	100,000	Delta	1
Mexican Light and Power Co.	6,000	85,000	Star	1
Telluride Power Co.	1,500	80,000	Star	1
Edison Electric Co. (Los Angeles)	1,660	75,000	Star	1
Pennsylvania Power Co. ...	10,000	70,000	Star	3
Missouri River Power Co. ...	1,500	70,000	Star	1
Southern Wisconsin Power Co.	1,000	70,000	Delta	1
Connecticut River Power Co.	5,000	66,000	Star	3
High Falls Development ...	1,100	66,000	Star	1
Canadian Niagara Falls Power Co.	1,250	62,500	Star	1

* This refers to the type of transformer, whether single-phase or three-phase.

In the operation of transformers the delta connection has an advantage. With one grounded conductor the service need not be interrupted, except perhaps if the ground is an arcing one, which might set up continuous high-frequency surges, producing high-voltage stresses on the transformers in circuit. Comparisons of different systems are shown in Table III, which are representative of practically all the most modern high-voltage transformer installations in the world. There are one or two of equal importance under construction.

From the standpoint of the operating engineer (neglecting all losses) the single-phase transformer is at the present time preferable where only one group of transformers is installed and the expense of a spare transformer would not be warranted, as in the delta-delta connected system. If one of the three transformers should become damaged it can be cut out with a minimum amount of trouble, and the other two can be operated at normal temperature on open delta at approximately 58 per cent. of the total capacity of the three. With a three-phase transformer a damaged phase would cause considerable inconvenience, for the whole transformer would have to be disconnected before repairs could be made.

Apart from the decrease in manufacturing cost with increase in size of units, the three-phase transformer possesses the advantage of requiring less material, and is more efficient than any other single-phase combination of transformers of the same kilowatt capacity; three single-phase transformers weigh 17 per cent. more than, and have 17 per cent. more losses than one three-phase transformer.

Where a large number of three-phase transformers is installed in one building, say, three groups or more, there is unquestionably a great saving over any combination of single-phase transformers.

The relative advantages of the delta-delta and delta-star systems are still disputed, and are open to discussion. From the point of view of first cost, the delta-star is unquestionably the better. The question will be largely governed by local conditions, and no definite system of connections can be given to suit all cases.

Whichever scheme of connections is decided upon, it will be always found advisable to keep to that scheme throughout the system; otherwise complications might result. This is particularly applicable on some of the larger systems of 100 megawatts and over, where networks of high-voltage transmission lines and substations are numerous.

Large power transformers operating high-voltage transmission lines should be protected against excessive currents, and also against excessive voltage above normal. Some protective apparatus or device should be used, even if it is only an overload device. Protection should be given against external and internal short circuits, such that the transformer will be disconnected in case of an internal short circuit, and that section of the transformer system relieved from any external short-circuit. For external short-circuits the external reactance is being favourably considered in limiting the flow of current. To get absolute protection of a system of transformers from internal and external causes is difficult, and in some cases impossible.

The more we centralise electric power systems the more we shall require the three-phase two-phase method of distribution, which will come about through the transformation from three-phase high-voltage transmission.

It is well recognised that any combination of the two-transformer method requiring a change from three-phase to two-phase, or from two-phase to three-phase, is made at the expense of regulation, as well as involving a loss in efficiency. If the connection is used to step up from two to three-phase, similar connections should be arranged for stepping down at the receiving end; in this way the possibility of cross currents or asymmetry will be avoided.

Continuity of service is now one of the main factors to be aimed at, and the three-transformer method shown in fig. 1 is in some respects superior to the two-transformer method. If one of the transformers in the three-transformer system should become damaged, making it inoperative, the two remaining transformers may be, in a very short space of time, temporarily connected in open-delta and service continued until the other is repaired, thus

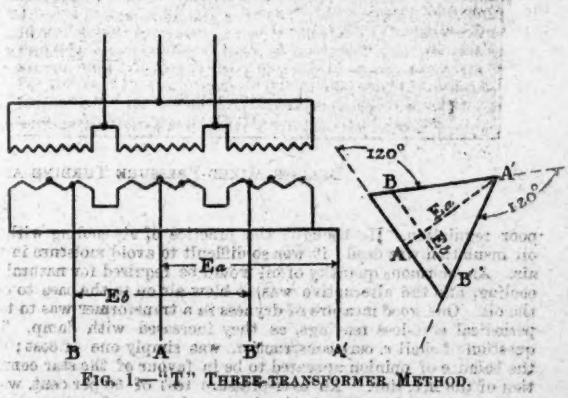


Fig. 1.—"T" Three-transformer Method.

avoiding the necessity of carrying a spare transformer in stock. And if a transformer is kept in stock, its kilowatt rating need only be approximately 67 per cent. as great as that of a spare transformer for the two-transformer system.

This system was only applied to practical city distribution a short time ago, and it is surprising what great strides have been made. It also claims the advantage of supplying both three-phase and two-phase currents to a secondary distribution of four wires, this being a special advantage in cities where there already exist two or more electric power companies operating both two and

three-phase systems, as no transformers are required for connecting either a three-phase or a two-phase motor. From the point of view of reliability of operation the three-transformer system has far greater advantages than the two-transformer system.

It is feared by some transmission engineers that the high-voltage transformer will again become the limiting feature of high-voltage transmission because of the internal effect due to corona. This effect so far has not been very noticeable, but as line voltages are increased above present-day practice (110,000 volts) certain effects due to this discharge may arise which may radically change the present methods of design in high-voltage transformers. Whenever possible, transmission engineers recommend switching-in first the transformers at the far end of the line and afterwards the transformers at the generating station.

With the large systems now being operated, consisting of 100 to 150 megawatts in generator and transformer capacity, and hundreds of miles of transmission lines supplying thousands of customers of all classes, maintenance of a very high degree of reliability is *the* principal problem of the engineer. The question now before us is that of limiting the amount of energy which can flow into a fault or short circuit, and the only real practical solution applied so far is the use of reactance, which is the enemy to voltage regulation.

Discussion.

Mr. W. B. Woodhouse, in opening the discussion, pointed out a number of obvious errors in the paper. The author referred particularly to transformers used in connection with water-power plants, where efficiency was not of such importance as with coal-fired stations. He also understated the regulation. Transformers with close regulation were often not robust enough for overloads, and it appeared that, with long-distance lines, one must submit to poor regulation. He thought the practice of air cooling without oil insulation was dead; it was so difficult to avoid moisture in the air. An enormous quantity of oil would be required for natural oil cooling, and the alternative was to blow air on to the case to cool the oil. One good measure of dryness in a transformer was to take periodical core-loss readings, as they increased with damp. The question of shell *v.* core construction was simply one of cost; and the balance of opinion appeared to be in favour of the star connection of the H.T. line. An over-pressure test of 30 per cent. was a good one for picking out the weak places in a transformer.

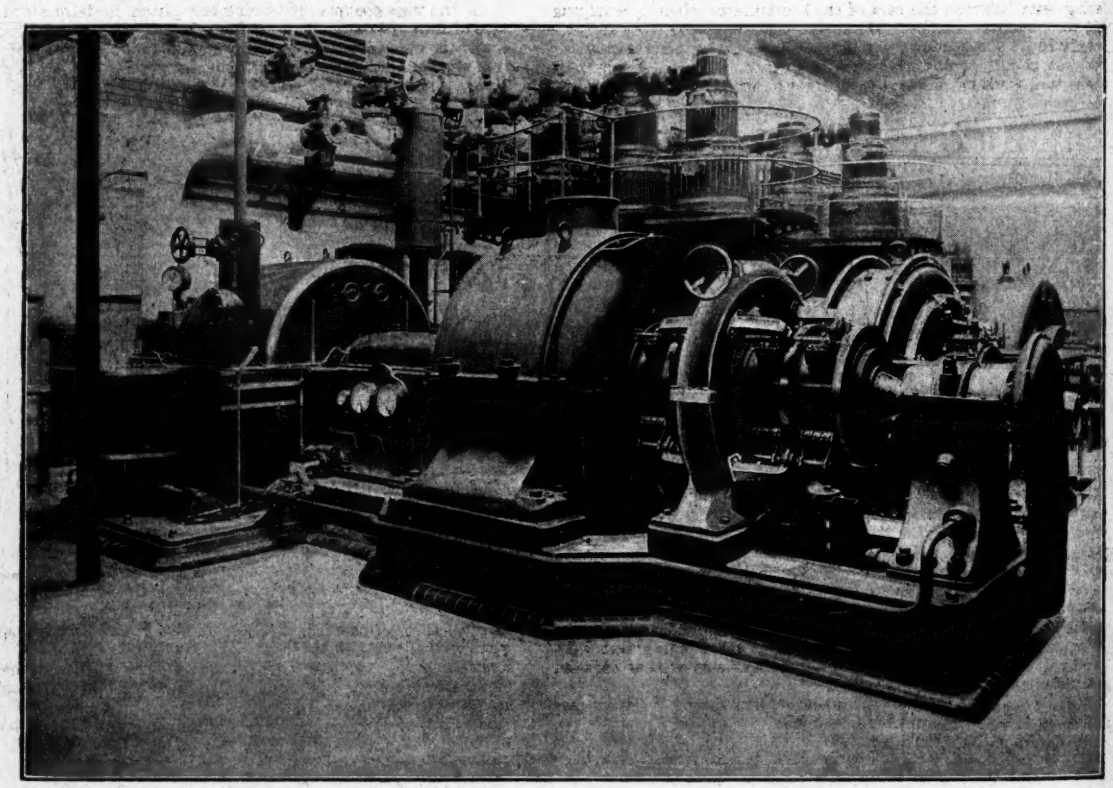
Mr. C. H. Merz said he was surprised that the author appeared to ignore the difficulties of transformer design, the chief of which was to produce a transformer which would withstand mechanical failure of the coils. He thought that all large makers of transformers were having some trouble. The only suggestion to-day was to make the regulation worse, and this was inadmissible; if automatic regulation was desired in the sub-station, the regulation must be within 2 or 3 per cent. It was very necessary to design transformers so that there were no hot places; he thought that in America they were not so careful in this matter. He found them satisfied if cleaning did not take place oftener than once or twice a year, but in this country transformers were expected to run for years without cleaning.

Mr. J. S. Peck said the paper was full of small errors, and very difficult to understand. The author strained every point in favour of shell construction. In a modern works the tendency was now to ship the transformer complete in its tank, without terminal bushes, which were fitted after erection. He did not consider that the core transformer described by the author would be good enough for this country, while the proportions of the shell transformer shown in the paper were obviously wrong. Water-cooled coils tended to freeze in cold weather and burst the pipe; it was difficult to get the water out of such coils. As regarded oil, it was difficult to obtain one which would not throw down a deposit when heated. This deposit covered the cooling pipes and heat-insulated them, so that the cooling effect disappeared and the transformer heated up, possibly, until it failed. In conclusion, he found many discrepancies in the diagrams of transformer connections shown in the paper, some of which were impossible.

PLANT EXTENSIONS AT SOUTHWARK.

We recently referred to the starting-up of a new mixed-pressure turbo-plant at the Southwark Borough Council's generating station in Penrose Street.

The plant consists of a Belliss turbine of the impulse type, the H.P. stages being compounded for velocity and the L.P. stages for pressure; the latter stages are drum built.



Belliss Mixed-Pressure Turbine and General Electric Dynamo at Southwark.

Both high and low-pressure governor valves are provided, as the turbine will be required to run on occasion on different circuits to the reciprocating sets supplying the exhaust steam; the governor gear includes separate oil relay systems for both main and emergency valves.

The turbine exhausts into a Worthington surface condenser, with a three-throw air pump and attached hot-well pump, motor-driven, as well as a 12-in. centrifugal pump for circulating the condenser water to a Devonport cooling tower erected over the boiler-house roof.

The turbine set operates at a speed of 1,500 R.P.M., driving a General Electric D.C. generator, with an output of 600 KW. at 300 volts. The generator is of the enclosed type with self-contained fan ventilation, the air being drawn through a duct in the foundation and expelled from an outlet at the top of the frame. The field system includes four commutating poles, and a compensating winding distributed over the whole face of the main magnet poles. The rotating portion of the machine consists of an armature of high permeability steel stampings supported and keyed directly on to the shaft, and clamped together by two rigid cast-steel end plates which, at the same time, form a support for the projecting portion of the armature winding

The armature is fitted with fans, which give both axial and radial ventilation to ensure cool running under all conditions of load; the armature winding is bedded in slots in the core, and held in position by strong maple wedges, the ends of the windings being bound down solid their whole length to prevent any movement. The armature reaction, which in a machine of this kind would be rather stronger than usual, is neutralised entirely by the action of the compensating winding mentioned above. The commutator is assembled on steel cones rigidly keyed to the shaft and clamped in position by large nuts threaded on the shaft itself. The brush gear of the machine is of entirely special design adapted for running with the high speed. This is most important if one remembers that the peripheral speed of the armature corresponds to 14,000 ft. per minute, and the peripheral speed of the commutator is about 8,500 ft. per minute.

In order to ensure cool running of the commutator a special fan is fixed on the outside of the bearing, which blows air on to the commutator surface from the under side of the machine. This, at the same time, removes any dust or small particles of carbon which may become detached from the brushes.

The brush-holders are arranged so that the tension of the brushes can be altered whilst the machine is running, and also any brush can be lifted off the commutator at any time independently of all others.

The terminals of the generator are arranged at the bottom so as to be out of the way.

The generator is also fitted with three slip rings and the necessary brush gear which are connected to the armature of the machine in such a way that a portion of the output can be obtained from them as alternating current, whereas the main portion of the output will be continuous current only.

Before being sent out to work, the machine was subjected to insulating tests between the bars of the commutator made by applying 400 volts between each bar; the actual working voltage between bars is only 16·7; a breakdown voltage and flash test on the commutator between the rings and the working portion with 3,000 volts A.C., the actual working pressure would never exceed 500 volts; a test on the armature winding with 2,000 volts A.C. applied for a quarter of an hour and a 2,500-volt flash test; a field winding test with 2,500 volts between the live parts and the frame as well as between the different parts of the winding.

After assembling, the whole machine, including the brush gear and the connecting leads, was flashed again with 2,000 volts, which is equivalent to four times the working pressure.

AUTOMATIC CIRCUIT-BREAKERS WITH RETARDED OPERATION.

IT is now an accepted axiom that automatic circuit-breakers of the overload type should be fitted with retarders or time lags which will prevent the supply being cut off unnecessarily when overloads of very short duration come on a feeder.

These short peaks occur very frequently, and are due to various causes, such as the starting-up of motors. Engineers, however, have often preferred to dispense with time lags rather than impair the reliability of the circuit-breaker by a device that might fail to act in an emergency.

A retarder, or time lag, if it is to be depended upon in actual service (where it will rarely get any attention) must be devoid of delicate and intricate mechanism, and the principle of its operation must be such that under no conceivable conditions can it prevent the circuit-breaker from operating if an overload has been on long enough to be dangerous. Also, it should be capable of easy adjustment; that is, be so arranged that the time of retardation can be altered at will to suit the actual, and sometimes varying, conditions of the service of the particular feeder or circuit protected by the circuit-breaker.

It is claimed that all these features are realised in the Ellison patent adjustable time lag, the principle of which is based on the flow of oil in a dashpot. The latter, as will be seen in fig. 1, is of very simple construction. The periphery of the piston is tapered slightly, and at one end the cylinder is correspondingly bored. Adjacent to this end the cylinder rapidly increases in diameter. The piston is attached to the solenoid plunger or armature of the

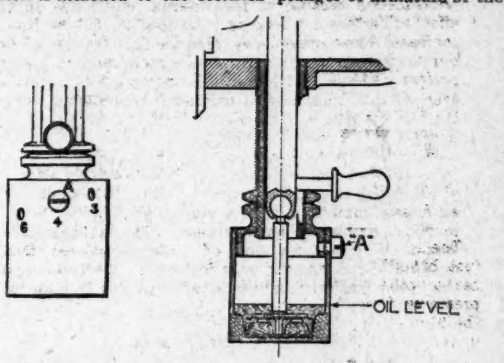


FIG. 1.—ELLISON PATENT TIME-LAG; SECTION AND ELEVATION OF DASH-POT.

circuit-breaker. When the plunger is drawn up (by an overload), the oil escapes through the annular passage between the piston and the cylinder from the upper to the lower side of the piston. The object of the tapered form of the piston and cylinder is to permit adjustment by varying the clearance between them.

As the time occupied in raising the piston is determined by the rate of flow of the oil, it is evident that if the aperture round the piston is increased by lowering the cylinder, the rate of flow is increased and consequently the time required to pull up is reduced. The cylinder is provided with a number of holes or settings, and by turning the cylinder round, the holes will each in turn coincide with the tapped hole in the cap and allow the screw "A" to be screwed home, locking the cylinder in the position where the required retardation is obtained. It will be seen that this time lag is so simple that it can hardly fail to act when required.

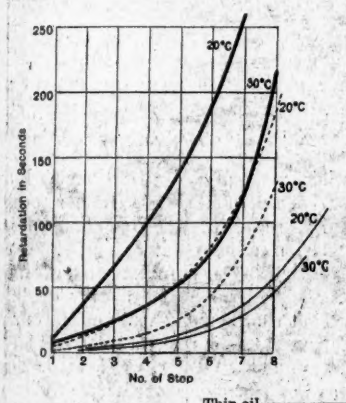


FIG. 2.—TIME LAG SETTINGS WITH THIN (CYCLE) OIL, THICK OIL AND GLYCERINE.

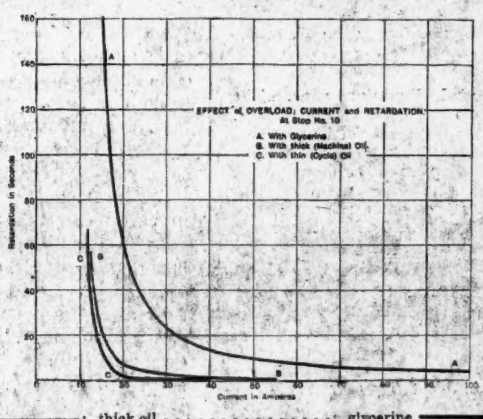

EFFECT of OVERLOAD CURRENT and RETARDATION
At Stop No. 10
A. With Glycerine
B. With thick (Machine) Oil
C. With thin (Cycle) Oil
Retardation in Seconds
Current in Amperes

FIG. 3.—OVERLOAD TESTS.

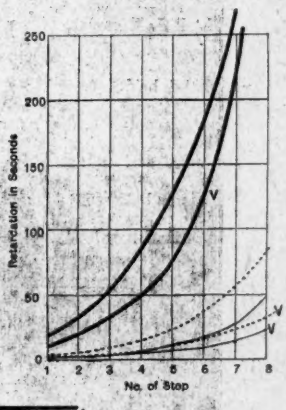


FIG. 4.—EFFECT OF V ON TIME LA IBRATION

Thin oil ——————; thick oil - - - - - - - - - - - - - - ; glycerine ——————.

The time lag has been tested by the National Physical Laboratory at Teddington, and the following is an abstract of the report, with the test curves obtained:—

The circuit-breaker tested was rated for a normal maximum current of 10 amperes, and the time lag was set initially so that with thin oil the retardation at No. 1 setting was about 3 seconds. Tests were made of the time of retardation with thin and thick oil, and with glycerine, at the various settings, and the results are shown on the accompanying curves (fig. 2), which, says the report, may be regarded as typical of the results to be expected with these liquids. During these and other tests of the various settings, the current was kept constant at 13 amperes, an interval of one minute being allowed between observations to enable the piston to settle again in the fluid.

The time lag with various overloads up to 100 amperes, with each of the retarding fluids named, was tested at the No. 10 setting, and the results are given in fig. 3. In order to ascertain the effect of vibration on the time of retardation, tests were made while the circuit-breaker was subjected to considerable vibration; as will be seen by comparing figs. 2 and 4, the effect was to reduce the time of retardation by about 50 per cent. Slow oscillations over an arc of 17°, as on board ship, had no appreciable effect upon the results, which were practically identical with those obtained when the circuit-breaker was erected on a level immoveable base.

There are 11 different time settings in this time-lag, and an examination of the curve, fig. 2, demonstrates that it can be set to give any retardation that may be desired from 1 second up to as much as 5 or 6 minutes. Fig. 3 shows that the time-lag has a true inverse time element—that is, that as the overload increases, the retardation diminishes. It will also be seen that, by using a different kind of oil, the curve can be altered to suit the requirements.

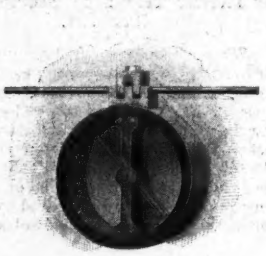
Fig. 4 shows that considerable vibration only reduces the time of retardation, and as there are 11 settings, there is no difficulty in obtaining the exact time of retardation required.

The makers have supplied these time-lags to Corporation electricity supply power stations and other important installations, where they are giving entire satisfaction in actual service.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Electrostatic Pressure Indicator.

The Allgemeine Elektricitats-Gesellschaft, of Berlin, has just brought out a neat little device for indicating whether a bus-bar or other bare conductor is charged or not; it is suitable for pressures from 3,000 to 75,000 volts. It acts on the principle of the Kelvin voltmeter, and consists of a cylindrical box of insulating material with a clamping terminal, which is connected to a



A.E.G. Electrostatic Pressure Indicator.

vertical metal bridge carrying a pivoted aluminium vane. The instrument is permanently clamped to the conducter under test. When the conductor is dead, the vane rests in a vertical position behind the bridge, but if the conductor is charged, the vane is deflected more or less, according to the pressure, as shown in the illustration.

For pressures between 3,000 and 10,000 volts an earth connection is necessary to increase the sensibility of the device. A portable form is also made.

LEGAL.

Automatic Telephone Patent.—Extension Petition Withdrawn.

The petition, under the Patent and Designs Act of 1907, for an extension of a patent granted to one Thompson in 1898 for automatic telephones, was before Mr. Justice Parker in the Chancery Division for hearing with witnesses, but upon being called on was withdrawn.

Mr. Courtnay Terrell, for the petitioners, the Automatic Electric Co., said that with the consent of all parties he had to ask for leave to withdraw the petition upon terms; these terms would include the payment of the respondents' costs of the petition.

Mr. Walter, K.C., representing one of the respondents, confirmed the agreement come to.

Mr. Gray, for another, said that no terms had been submitted to him, but as the Act only allowed for one set of costs for all the respondents, he was not concerned with them.

Mr. Astbury, K.C., representing the third respondent, asked that the costs should include the costs of the two previous applications which had been reserved.

Mr. Terrell said he could not resist that.

His Lordship accordingly allowed the petition to be withdrawn upon the terms agreed.

Doxford & Sons v. Wearmouth Coal Co.

In the Official Referee's Court on Wednesday, November 15th, Mr. Edward Pollock continued the hearing of a claim for damages amounting to £190,000 by plaintiffs, shipbuilders of Sunderland, against the defendants in respect to injuries caused to plaintiffs' shipyard, and notably to their large electric cranes, by land subsidence, alleged to be set up by the defendants' colliery workings.

The hearing was opened before Mr. Pollock at the Moot Hall, Newcastle, and was adjourned to London for further evidence to be heard.

Mr. Doxford, a director of the plaintiff company, and an engineer of 22 years' standing, gave evidence, and stated that their present electric crane plant was re-erected in 1901. In 1909 they noticed that the wheels of the travelling crane in their workshops were out of plumb, and the columns also canted two inches out of the straight. To true-up the shop it would be absolutely necessary to raise the iron girders until they again reached a horizontal position, and to raise the roof of the workshop a similar amount. As manager of the plaintiffs' shops, he could not think of working the machinery in such a state. Giving further evidence, witness, by the aid of plans, showed subsidence of plaintiffs' huge travelling crane or gantry situated on the quay-side. It had sunk a considerable distance and the bedplate had cracked. As a result of this sinking, plaintiffs had had to stop the work of heavy lifting from ships at the quayside at high tide, because it was impossible to lift the weights clear of the ship's casing. The delay thus caused amounted to two or three hours a day, which was serious and involved great loss.

Mr. Bailhache, for defendants, submitted that the damages claimed by the plaintiffs were outrageous. They were entitled to a reasonable sum which would put their yard into a proper and efficient state of repair, but they were not entitled to an amount which they considered necessary to meet their own peculiar views on shipbuilding.

Expert evidence was then given for the defence.

(To be continued.)

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Institution of Electrical Engineers.

As an adequate discussion of the proposals of the Council can only be obtained by means of the technical Press, I beg to address to you some ideas which have occurred to me regarding this matter, more particularly concerning the proposed examinations for admission to Associate Membership.

With some of the other suggestions of the Council I am in agreement, but to this one I must give the strongest possible opposition. According to the remarks of the honorary treasurer, at the meeting on November 2nd, the examinations are to be started in order to secure a "warranty that a Member or Associate Member is a duly qualified electrical engineer." That the Council should endeavour to establish such an examination test is really a matter of great surprise, as I have always understood that we counted among the members thereof, as well as among our past presidents, several gentlemen who have stood in the forefront of the battle against the old fetich of the examinational system. Recently it has even been proposed to do away with the system of examinations through which a medical student has to pass in order to qualify for admission to the medical profession. That it is possible to determine by examination that a man is a "duly qualified electrical engineer" is, to my mind, absurd. To select such a test is a distinctly retrograde step.

I would also venture to prophesy that the system will not work in practice. The main function of any system of education is to train the mind and body of the student. Examinations conducted during the course of such training serve a useful purpose in determining whether the student is taking advantage of his opportunities. It cannot be said, however, that the effect of the training is lost, if after a few years the student is not able to polish off college exercises with the facility he possessed when he was a raw student.

Everybody who knows anything about engineers is acquainted with many men who would be most suitable members of our Institution who would be stumped if you gave them a differential equation to solve which they would have snapped their fingers at when they were students; for after all the "duly qualified electrical engineer" has to know such a lot nowadays that his "book-learning" often gets somewhat rusty, and my chief objection to the proposed examination is that it must of necessity be largely a matter of "book-learning."

Consider, again, a case somewhat of the following nature:—A man during his apprenticeship becomes a student of the Institution. At the conclusion of his period of training he is transferred to the suggested new class of

Licentiates. He rises in his profession and becomes, let us say, chief draughtsman in a large firm of engineers, or chief assistant engineer to an important corporation, and, perhaps, attains the age of 28 or 29 years. He is now a very desirable candidate for Associate Membership. I would now ask, is it likely that such a man, after occupying positions of high responsibility, will submit to the indignity of entering for an examination to test his qualifications, very likely at the same time as one of his own juniors fresh from College, who has probably much more chance of distinguishing himself in the examination than his own chief? The thing only requires to be stated to demonstrate its impossibility.

By all means let the Council "tighten the net" and render the conditions of admission more stringent, but let this be done in a rational manner. I would suggest that local committees might be formed which could advise the Council in London as to the actual positions and work of the applicants. More members might be required to support an application. Candidates might even be required to have a personal interview with the Selection Committee, and there are numerous other means which the Council could employ to the desired end without reverting to an old-fashioned vicious examination test.

Charles C. Garrard, M.I.E.E.

Sutton Coldfield,
November 13th, 1911.

In your leading article on the above subject in yesterday's issue, occurs the following passage :—"Perhaps the most difficult question to solve is the designation of the new class for which the term 'Licentiate' was suggested. After long consideration of the matter, we are driven to the conclusion that this title is absolutely inadmissible; the objections to it are insuperable."

A purpose of the Council in founding this class is, *inter alia*, to give men the benefits of the Institution, the training which membership brings, and the increase of knowledge derived from attendance at the meetings . . . . men who may later be sufficiently experienced to become corporate members.

The Institution with its various classes may be likened to a tree with its several branches. It is desired to add a new branch of the same species but different in quality, and so with a bit of string and a daub of clay, one sticks on a shoot containing a bud of considerable merit, which becomes in time incorporated with the tree, and derives sustenance therefrom.

As with yourselves, so with the Council. They met a difficulty in selecting a name that would suitably express the quality of the class—a name not too long or kakophonous.

I find that the word "graft" (of which a dictionary definition is "a small shoot inserted into a tree as the stock which is to support and nourish it") fulfils all the required conditions, and, moreover, the abbreviated title "G.I.E.E." or "Graft I.E.E." is both expressive and euphonious.

Sidney Sharp.

Westminster, *November 18th*, 1911.

The Demand for Technical Men.

One cannot but admit that "Observer's" letter in last week's Review has shed some light on the cause of the failure of "The Demand for Technical Men." But is it not also true that the engineers and managers of concerns actually encourage this failure, by asking for qualifications only very remotely connected with the positions they are seeking to fill?

How many men are there who stick to one job for a number of years with the idea that a good experience in it will enable them to obtain better positions, only to find that experience of a totally different nature is demanded for a similar job when advertised?

Should a man seek this other experience? Nine times out of ten he is forced to take an appointment in the branch he wants the experience in at a lower position and salary than he previously held. Then when he next tries to obtain a higher berth *his existing position* has frequently more influence in deciding the question of appointment than his experience.

A. C. E.

November 15th, 1911.

Corruption.

Your leading article on the subject of corruption tempts me to write a reply. First of all, the "old law," dealing with municipal life, to which you refer, was passed only in 1889, and the working of the Public Bodies Corrupt Practices Act showed that legislation was necessary to combat an evil which was even more widely spread and more difficult to detect.

There have been no prosecutions, and so far as I know, no attempt to prosecute, in the case of trivial and innocent tips. This is effectively guarded against, inasmuch as the Prevention of Corruption Act provides that the Vexatious Indictments Act, 1859, shall apply. You say that the convictions have been almost all of a most trivial character, but it is not wise hastily to pass judgment without a full knowledge of the facts. You add that on two occasions men have been punished for giving some pence to draymen for carrying messages or parcels to their next place of call. This may seem trivial, but the offence which it was desired to stop was not trivial. On the contrary, the carrying companies found that their employés were being bribed on quite a wholesale scale to carry parcels during their working hours, the men neglecting their proper work and putting the bribes (less, of course, than the legitimate charges would have been) in their pockets. You should take the costs into consideration. In one case a man was fined 40s., but his costs came to nearly £80; in another a man had to defray the costs of protracted police-court proceedings, and of two days' trial at the Assizes, in addition to the apparently "trivial" fine of £10.

If you will examine the list of convictions published by the Secret Commissions and Bribery Prevention League, you will see that "the kind of bribery which was aimed at" has not escaped. Only recently a member of a well-known Institution, to which many of your readers belong, was sent to prison for six months with hard labour, without the option of a fine. In another case, a West End solicitor was fined, including costs, £142.

As one of those present at the Mansion House, I may be allowed to say that the meeting was not "convinced that the evil was unchecked and growing," but that it is "still rampant and corrupting all classes," which is quite a different thing. It would be idle to pretend that the Prevention of Corruption Act has not checked the evil in many quarters, though not to the extent that inexperienced enthusiasts hoped for. Rome was not built in a day, and one cannot expect in a few months or years to eradicate an evil which the late Lord Russell described as a malignant canker.

With regard to the Attorney General's fiat, I speak from personal knowledge when I say that at least one important action has been prevented by the law officers. The weight of evidence is overwhelming. As Sir Edward Fry's letter, read at the Mansion House, stated—

> The notion that it in any way diminishes the possibility of blackmail or that there is more probability of blackmailing in prosecutions of this kind than in any other, seems to me to be groundless. The great difficulty of the working of the Act consists in the scarcity of evidence, and I think that attempts to put the Act in force should be relieved from the burden of two trials, the one in camera before the Law Officer of the Crown, and the other before the Justices, with the possibility of a committal to the Assizes. The necessity of putting evidence before the Law Officer increases the expense and also causes delay, which in this case is especially serious.
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> But the most weighty objection of all to this condition arises from this: that it vests in the Law Officer of the Crown for the time being a real dispensing power—that is, that it places in his hands the capacity of preventing the enforcement of the law of the land, and the mischief which might be done by a narrow, though honest, interpretation of the Act, might be incalculable.
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> Furthermore, the provision is one which is, I believe, previously entirely unknown to our law, with the single exception of the Public Bodies Corrupt Practices Act, 1889, but there the condition may possibly be justified on the ground that, in the case of public bodies, the representative of the Crown, *i.e.*, of the public, is the proper authority to intervene, whereas, under the Act of 1906, private as well as public wrongs are dealt with.

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Your contention is, that the real trouble is that there are only two parties to the crime and no witnesses, and the law holds both equally culpable. As regards the first point, there is more likelihood of detection when there are two parties to the crime than one. Yet no one would condemn the law dealing with murder. In theory, the law does hold giver and receiver equally culpable; in practice, the receiver may get off, but the man who asks for a bribe runs the greatest risk of detection—greater even than the man who offers or gives the bribe. If giver and receiver are equally involved, then I submit that the responsibility of the giver is the greater, as he is generally richer and better educated than his co-criminal. I recognise the difficulties of dealing with this great evil, but the task is not impossible.

With your last paragraph I am in entire agreement. The cultivation of a strong and healthy public opinion is all-important, and compared with it convictions are comparatively unimportant. Immorality is hardly decided by the number of convictions. One does not ask the police how many thieves are not found out. To create a strong and healthy public opinion has been the principal object of the Secret Commissions and Bribery Prevention League, which, I am glad to say, ranks among its members many connected with the engineering and electrical industries.

The Secretary of the League.

London, E.C., *November 20th*, 1911.

[We are glad to give this letter publicity, but we regret that the League should appear so hostile to some of our contentions, as we know it to be an influential body; and we believe that it has the opportunity of being one of the main factors in cleansing the Augean Stable. But it should adopt a less combative attitude towards its fellow workers. We repeat that in the main the prosecutions have been for trivial offences. We did not say the penalties had been trivial. We are very glad to admit that two recent cases dealt with the main evil about which we wrote.

We enjoy being called "Inexperienced enthusiasts"—it makes us feel young again—but we must not be accused of expecting that "Rome would be built in a day" by the Corruption Act. We have always taken rather a pessimistic view, holding as we do that the Act is fundamentally wrong in punishing both the giver and the receiver of a bribe.

We still hold that as there are only two parties to the crime, and no other witnesses, the fact that the law holds both equally culpable tends to prevent disclosure; in fact, generally prevents it. Our correspondent says that there is more likelihood of detection when there are two parties to the crime than one. We quite fail to see how there can be less than two parties present when a bribe passes, unless it become customary to place it in the coal-scuttle, to be found by the blackmailer on his return. What we said was that the punishment of both prevents either from telling, which appears to us to be an incontrovertible proposition.

To say that the giver is generally richer and better educated than the receiver simply shows that the Secretary's mind is still running on tips and trivial gifts to railway porters and menials; and that he has missed the whole point of our article, in which we contrasted the position of a commercial traveller, who has to live upon his sales, with that of a salaried or well-paid buyer who gets his living no matter whose goods he recommends.

The citation of *one* important case in which the Attorney-General's fiat was used, wrongly in the opinion of our correspondent, by no means convinces us that this important safeguard should be removed. We humbly suggest that the Secretary of the Secret Commissions and Bribery Prevention League should read our article again; and we may add that we shall be the first to rejoice if he can put a stop to commercial blackmail, either with or without the alteration of the law which we have suggested.—Eds. E.R.]

Parliamentary Applications.—As is usual at this time of the year, notices of application to Parliament and the Board of Trade for powers for electrical and other new undertakings are now being filed in the *London Gazette*. In accordance with our custom, we shall deal with the whole when the *Gazette* notices are complete.

TRADE METHODS IN BRAZIL.

Reference has been made in the Electrical Review from time to time to methods which should be employed by firms desiring to secure trade in Brazil, a country in which there is an excellent opening for electrical development, and in which the demand for machinery of all kinds is steadily increasing. Recent reports from British Consular Representatives in Brazil again call attention to defects which must be remedied before extensive trade can be hoped for. The Acting Consul-General in Rio de Janeiro, writes as follows:—

"The possibilities of this district, which includes the Federal capital, are very great. Mention was made last year in a report from this Consulate-General of the absolute need of the personal element in business in Brazil. I have become more and more convinced of the uselessness of a very large proportion of the catalogues which are sent to this capital. Possibly a certain amount of trade can be obtained by this means of canvassing, but in that case it behoves the canvassers to see to it that this, their only means of canvassing, is quite up-to-date and adapted to the needs of the market. I have made a special point during the past year (March, 1910, to March, 1911) of carefully studying each of the numerous catalogues sent to this Consulate-General, and I venture to express the opinion that the majority of them err on the side of not giving sufficient information of the right sort. The article for sale is often quite well described and its use sufficiently explained (in the English tongue), but terms of business are not mentioned. Nothing is said about discounts, modes of payment, commission, &c. Possibly firms are not desirous of publishing such information in a catalogue, but if a catalogue or a circular letter is the only means employed to bring the name of a firm before possible buyers, it would seem that some such information must be furnished in order to secure orders. If a local house cannot give a price immediately to a prospective buyer the chance of trade is often lost. Not more than three or four catalogues printed in Portuguese have been received at this Consulate-General.

"It is satisfactory to note that there has been a slight increase in the number of British business men visiting Rio de Janeiro during the period under review.

"What is, I believe, eminently desirable, is that the heads of firms should visit Rio de Janeiro more constantly from the United Kingdom. The conditions of the country have changed and are changing with remarkable rapidity, and it would seem that British trade can only keep pace with such changes if the managing interests at home have an accurate knowledge at first hand of the ruling conditions of the market. They would thus be able to support their representatives out here with greater effect. The firms that are doing the best business are undoubtedly those that are managed on the spot by the heads of the firms themselves; and though the presence of these gentlemen is obviously impossible in all businesses, yet periodical and constant visits would, without a doubt, be of much use to all parties concerned.

"The number of British business houses here now is considerably less than in the past. Possibly those that exist do a bigger business, but it would seem to me, from letters I receive, that a great deal of the business which firms in the United Kingdom are desirous of doing is much too small to be worth the consideration of the larger commission houses, and a smaller commission house might be able to handle such business successfully. For this a thorough knowledge of local conditions is essential. It is doubtful whether commercial travellers working entirely independently can be very successful here in new articles, and firms wishing to open up a new trade in Brazil might do well to come to some arrangement with one of the well-known commission houses here, by which the traveller sent out (who would speak Portuguese) could work in conjunction with such a house. Whatever trade our foreign rivals in this market have taken from us, has been acquired by virtue of a close study of the local market and of local conditions and requirements, such as is well within the capacity of British business men to acquire, and which the big British firms here have acquired and make use of. If exporters at home really desire to extend their operations in this country, there is no reason why they should not be able to do so. They must, of course, be prepared to go to some expense and to accept perhaps somewhat large risks in certain cases, but the gains are proportionately great, and it is on these lines that their competitors are working.

"The United Kingdom still supplies about 26 per cent. of the total imports, as against about 15 per cent. from Germany, 12 per cent. from the United States, and 10 per cent. from France. There is no reason why she should not continue to remain the principal supplier of this country. A falling off in the importation of a certain article may very often be merely an indication that it is necessary for the supplying firm to send out a responsible man to talk over matters with its agent and perhaps with some of the buyers."

The British Consul at Pernambuco writes that in spite of the advice that is annually given in Consular reports, inquiries are constantly received from manufacturers and merchants in the United Kingdom as to the best means of obtaining an opening for their goods in Brazil. Little can be done by correspondence, and then only in the Portuguese language, and not in Spanish. Catalogues, lists, &c., should also be in Portuguese, and prices quoted in milreis at, say, 1s. 4d.; weights should be given in kilogrammes. Large exporting houses in London, Manchester and Birmingham, &c., have well-established agencies in each Brazilian port, and the bulk of the British exports to Brazil are distributed by this means. Travellers who know the country and language well also make their regular visits, often representing two or three different lines of goods. Manufacturers of goods that are retailed in small quan-

tities should either furnish samples to a traveller who has already a good connection in Brazil, or should come to some arrangement with one of the exporting houses in the United Kingdom. Direct business between the manufacturers at home and the shopkeeper in Brazil means long credits, unsatisfactory business generally, and bad debts. A traveller who does not know the language and people is, as a rule, equally unsatisfactory. German imports have cut into British trade very seriously during the last few years. German travellers are very capable, carry a full range of attractive samples and pay great attention to details. German manufacturers also study the requirements of the market, and give much attention to the question of new and original patterns, which is an important element of success when looking for orders in Brazil.

The British Vice-Consul at Cuyaba gives some interesting details which throw a light on the difficulties to be met with in trade with certain parts of Brazil. He writes :—

"Goods are usually sold here on draft terms at six months from date of invoice. It is evident that when goods take from 10 to 14 months (a common occurrence) to arrive in Cuyaba, a merchant is called upon to pay his drafts long in advance of his receiving his goods. I have instances of merchants who have large sums of their capital locked up in this manner, representing drafts paid to foreign houses and no news whatever of their goods. Firms in this State are strongly disinclined to pay their drafts before the arrival of their goods. In this they are helped by our German competitors, who send their representatives to the district to study the difficulties and arrange their terms of credit accordingly. It is quite common for foreign houses, with the exception of British and American, to allow as much as three months' credit from the date of arrival of goods in the port of Cuyaba. During the year just closed, 25 German travellers visited the State, and three British, one of whom did not arrive as far as Cuyaba, making a total of two who actually visited the capital. There are at the present time three Germans representing German houses permanently stationed at Cuyaba, and one British. In Corumba there are four Germans permanently stationed and no British. I would impress upon British firms the importance of sending out men to this zone who are prepared for all difficulties. It is no use a man arriving at Corumba for instance, and, because up to that point he has had to put up with food and accommodation that is somewhat below what he would get on a British liner, feeling that he is not justified in continuing the worst part of the journey. I speak now of the dry season, when one has very often to spend days on a barge with little food and no accommodation whatever. I personally have spent four days on the hot roof of a barge, which was my only bed during this time, without either rug, pillow or mattress."

BUSINESS NOTES.

Dissolutions and Liquidations.—Imeson, Finch and Co., Ltd., Bridge Road, Stockton-on-Tees, tramway engineers (in voluntary liquidation).—A meeting of creditors was held at Stockton-on-Tees on November 15th, creditors amounting to £2,915 out of a total liability of £3,468 being present or represented. Mr. J. W. Brown, of Messrs. Hanson, Brown & Co., Ltd., Middlesbrough, presided. A statement of affairs was submitted by the liquidator, Mr. T. R. G. Rowland, and the deficiency explained. After a full discussion of the present position, it was unanimously resolved that the following gentlemen be appointed to confer with the liquidator as an Advisory Committee for the purpose of ascertaining the present market values of the assets with a view to a sale to the best advantage :—Mr. Joseph Robinson, of Messrs. Geo. Scott and Sons, Ltd., Stockton ; Mr. Isaac Robson, of Messrs. I. Robson and Co., Ltd., Stockton ; Mr. J. P. Wilson, of Messrs. Wilsons, Pease & Co., Ltd., Middlesbro'. It was resolved, *nem. con.*, that the voluntary winding-up as resolved at the shareholders' meeting be approved, and that it was not necessary to apply to the Court for the appointment of a Committee of Inspection. The statement of the liquidator showed a surplus of £847 as regards secured creditors, a deficit of £878 as regards unsecured creditors, and a total deficit as regards shareholders and unsecured creditors of £3,885. The following are the principal unsecured creditors :—

Bainbridge Ltd., A., ...	£16	Imperial Brake Block Co., Ltd.	£24
Brown & Sons, J., ...	66	Manc. Armature Repair Co. ..	122
Brit. Insu. & Helsby Cables, Ltd.	25	Phosphor Bronze Co., Ltd. ..	26
Carr Bros., Ltd.	52	Robson & Co., Ltd., I., ...	20
Clegg & Howgate, Ltd.	62	Scott & Sons, Ltd., George, ..	17
Dyer & Young	38	Smith & Co., Frederick, ...	69
Dennis & Co., W. F., ...	27	Shropshire Iron Co., Ltd. ..	55
Foster, Brotherton & Co. ..	20	Standard Underground Cable	
Heaton & Dugard, Ltd.	20	Co., Pittsburg, U.S.A. ..	44
Hanson, Brown & Co., Ltd. ..	202	Worsley & Co., Peterborough ..	50

Creditors must send particulars of their debts, &c., to the liquidator, Mr. T. R. G. Rowland, Victoria Buildings, Stockton-on-Tees, by December 23rd.

Power Accessories, Ltd.—Creditors are asked to send particulars of their debts, &c., to the liquidator, Mr. S. P. Hutton, Rolt Street, Deptford, S.E., by December 6th.

Ashton & Shepstone, lighting, heating and electric light and power contractors, 183/185, Above Bar, Southampton.—Messrs. H. M. Ashton and M. A. Shepstone have dissolved partnership. Debts will be attended to by Mr. Ashton, who will continue the business as "H. M. Ashton."

Slater, Batty & Co., mechanical, electrical and automobile engineers, Bridge Street and Market Square, Hitchin.—Messrs. C. A. Slater and D. E. Batty have dissolved partnership, from June, 1911. Mr. Slater attends to debts, &c., and continues the business under the old style.

Hughes & Whiteley, electrical engineers, 2, Back Clement Street, Llandudno.—Messrs. W. Hughes and A. Whiteley have dissolved partnership as from December 18th, 1910.

Midland Camera Co., Ltd.—A meeting of creditors was called for November 20th by Mr. G. H. Fookes, the liquidator, who announces that by arrangement with the debenture-holders, he will be enabled to pay creditors in full as soon as the list of debts and claims is finally settled.

Turbine Corporation, Ltd.—A meeting will be held on December 22nd at 64, Gresham Street, E.C., to hear an account of the winding up from the liquidator, Mr. Percy Mason.

Messrs. Brooks & White, electrical and mechanical engineers, 10, Maclise Road, West Kensington, London.—Messrs. W. P. Brooks and A. D. White have dissolved partnership. Mr. Brooks attends to debts, &c., and continues the business under the old style at the same address.

For Sale.—Messrs. Wheatley Kirk, Price & Co. are offering for sale by tender (until November 30th) the premises, plant, machinery, stock, stores, and work in progress, also goodwill, patents, &c., of the Beck Flame Lamp, Ltd., of Hayes, Middlesex, by order of the Receiver for the debenture-holders.

Book Notices.—The British Fire Prevention Committee has decided to publish early next year an important illustrated tabular summary of the results of its official fire tests with 60 fire-resisting doors, covering an experimental period of 12 years. The summary will be published at £2 2s. net. Later a similar summary dealing with 15 different types of fire-resisting partitions will be published at 10s. 6d. net. These publications will be additional to the usual reports and well-known "Red Books" of the Committee. New subscribers to the Committee's publications enrolled at this period (November and December, 1911) whereby their subscription ranks until the end of 1912, will have the benefit of a number of publications of exceptional importance, as well as the useful publications issued by the Committee in the ordinary course. The subscription to the publications (£2 2s. per annum) allows for use of the Committee's inquiry office as well as of obtaining back issues of the 150 "Red Books" already issued at special figures, and the summarised results of 28 fire tests with fire-resisting floors, otherwise only obtainable at £1 1s. net. Inquiries should be addressed to the Assistant Secretary of the British Fire Prevention Committee, 8, Waterloo Place, London, S.W.

"*Journal* of the American Society of Mechanical Engineers." November, 1911. Baltimore, Ind. : The Society. Price 35 c.

"*Bulletin* of the Association des Ingénieurs Electriciens." August, 1911. Liége : The Association. Price 5 fr.

"*Bulletin* Scientifique de l'Association des Elèves des Ecoles Speciales." June-October, 1911. Liége : *Imprimerie Moderne*. Price 75 c.

"The Problem of Increasing the Load Factor." By G. Sartori. (Report submitted to the Turin International Congress.) Trieste : From the author.

"*Journal* of the Franklin Institute." Vol. CLXXII, No 5. November, 1911. Philadelphia : The Institute. Price 50 c.

"*Transactions* of the Illuminating Engineering Society." Vol. VI, No. 7. October, 1911. Easton, Pa. : The Society. Price 75 c.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXX, No. 2. November, 1911. New York : The Institute. Price $1.

"The Physical Review." Vol. XXXIII, No. 4. October, 1911. Lancaster, Pa. : The *Review* offices.

"Boiler Draught." By H. Keay Pratt. 1911. London : Constable & Co., Ltd. Price 4s. net.

Electro-Chemistry in Switzerland.—The report for 1910-11 of the Elektrizitätswerk Lonza states that the understanding which had been sought to be reached among the manufacturers of carbide and ferro-silicon was concluded during the year, although it necessitated a limitation in the production which involved sacrifices on the part of the company. On the other hand, prices were raised to a suitable level. The more favourable situation of the market was not experienced during the year, as a considerable quantity of old orders taken at low prices remained on the books and had to be cleared. After placing £29,000 to the depreciation fund, as against £26,000 in 1909-10, the balance permits of the debit balance of £48,000 brought forward from last year being reduced to £40,000. This is the third year the company has been unable to pay a dividend on the share capital of £480,000 whilst the loan debt amounts to £360,000.

Catalogues and Lists.—The General Electric Co., Ltd., 67, Queen Victoria Street, London, E.C.—New pamphlet (El1,512), giving full illustrated particulars regarding the Angold photographic arc lamps, embodying the latest developments. Tabulated reference numbers, voltages, currents and sizes of carbons, are included for medium and high power type lamps, double arc open type process lamps, and information is also published regarding automatic, suspension and adjustable travelling gear, and spare parts of the above lamps. Large numbers of these lamps have been sold to process and photo-engravers, cinematograph film makers, printers and photographers, and they have recently been used by lace-makers in taking blue prints of lace for travellers' use.

Messrs. British Insulated and Helsby Cables, Ltd., Prescot.—Postcard announcing reduced prices of the "B.I." metal-filament lamps.

Messrs. Richard Wade, Sons & Co., Ltd., Hull.—Sheet of illustrations showing timber for different purposes treated by the "Rüping" process of creosoting. Rüpenised telegraph poles (Norwegian and Russian), sleepers, fencing, and other examples appear among them, the object being to show the remarkable penetration of the Rüping process as compared with the old method.

Messrs. Samuel Gratrix, Junr. & Bro., Ltd., Quay Street, Manchester.—New catalogue (No. 174) (84 pages art paper) containing particulars and prices with illustrations of a variety of electrical accessories and appliances for lighting, heating and power. The manufactures listed include tantalum, Onewatt and Osram lamps, candle fittings, switches, ceilings roses, cut-outs, ironclad switches and fuses, ball fittings, shade removers, glass and silk shades, Holophane and other reflectors, hand lamps, "Tubolite," electric cooking and heating apparatus, fans, wires and cables, outside light fittings, arc lamps, motors and dynamos, car-lighting sets, and many other things.

Messrs. Gimson & Co. (Leicester), Ltd., engine works, Vulcan Road, Leicester.—Twenty-four-page pamphlet containing illustrated particulars and prices of their pumps and pumping machinery for deep wells, bore holes, public water supply and drainage, breweries and other industrial purposes. The pictures include views of electric motor and worm reduction gear used for driving pumps for Buenos Ayres railway, and at the Savoy Hotel, London.

Messrs. Berry, Skinner & Co., 78, Upper Thames Street, London, E.C.—Two new lists. No. 11,011 gives illustrations and brief particulars of foolproof motor starting panels, made up of their "Masta" type fused switches and rheostat on angle-iron framework. Prices are fully tabulated for open, semi- and totally-enclosed types series panels, and for starters for same. Ammeters or wattmeters can be fitted as required. List No. 2,101 particularises and prices a similar type of panel, with the exception that the switch is of the firm's "Micaloc" pattern, totally enclosed, but without fuses; these are supplied for installations where fuses are not always necessary.

The Hoffmann Manufacturing Co., Ltd., Chelmsford.—Circular No. 750, just issued, which is produced in excellent style, with choice half-tone illustrations, deals with the "Hoffmann" ball bearings applied to wood-working machinery. Copies can be obtained on application.

The British Aluminium Co., Ltd., 109, Queen Victoria Street, London, E.C.—12-page pamphlet (No. 118), well illustrated, regarding aluminium for motor and carriage building. Corrected copy of leaflet No. 119, relating to aluminium in the service of electric traction, in which it is shown that there are 8,000 aluminium coils in service not 850 as stated in the earlier list.

Messrs. Samuel Hartford & Co., Ltd., 67, Lord Street, Liverpool.—8-page price list tabulating particulars of Association and non-Association qualities vulcanised electric light wires and cables made by them. Copies can be obtained on application.

The Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, London, E.—Bound catalogue, now being issued for 1911-12, containing illustrations and information arranged in a very clear and attractive style regarding the Hart storage batteries. In addition to a short general index there is also a thumb index to sections. Erecting and working instructions are followed by tabulated particulars (capacity, charge and discharge rates, dimensions, weights and prices) of various lighting type batteries, motor-car and launch cells, traction cells, central station batteries, ignition batteries, motor-car lighting cells, portable batteries, and information concerning switchboards, cell-testing voltmeters, cell inspection lamps and sundries.

Messrs. Simplex Conduits, Ltd., 116, Charing Cross Road, London, W.C.—Weekly mailing card, No. 169, giving particulars of a new pattern lantern (in aluminium, polished copper, or oxidised copper) for outside and shop window lighting.

The Sun Electrical Co., Ltd., 118-120, Charing Cross Road, London, W.C.—New catalogue of more than 50 pages, containing up-to-date descriptive particulars, with prices and numerous illustrations of the "Kalkos" conduit system. Increasing demand has led to substantial reductions being made in prices of many of the standard fittings. Some photographic views appear of large buildings in which the "Kalkos" system is employed, including the new premises of the Institution of Electrical Engineers.

British Trade with Central America.—It is announced in the *Times* that the President of the Board of Trade, on the advice of the Advisory Committee on Commercial Intelligence, has appointed Mr. G. T. Milne to conduct a Special Mission of Inquiry into the conditions and prospects of British trade with the Central American Republics, Colombia and Venezuela.

Publicity Literature.—We have received from the Electric Supply Publicity Committee a batch of further leaflets, &c. One of these is a small black-and-white print of a cooking poster, which is issued lithographed in colours (25 in. × 40 in.). Another poster, lithographed in five colours, and made in two sizes (25 in. × 40 in. and 60 in. × 80 in.), represents a statue of Liberty holding an electric torch aloft in one hand, and carrying a luminous electric radiator with the other; this makes an effective appeal on behalf of both electric lighting and heating, which are "cheaper than ever." The electric vacuum cleaner, the public interest in which is so greatly increased now, has a leaflet to itself, "How to Save Housework," and how to use one Lloyd George servant stamp less. A small "cooking" mail card, a leaflet intended for shopkeepers, telling them how convenient it is, by the aid of a time-switch, to keep their shop windows lighted for hours after closing time, and a four-page circular outlining the good points of electricity as compared with gas, for lighting a home, are also issued. Specimens can be obtained on application to the Committee, at Moorgate Court, London, E.C.

Trade Announcements.—Messrs. Lord & Shand, of Plymouth and Newquay, have opened a branch at Guildhall Square, Launceston, Cornwall.

With reference to a notice appearing under this heading last week, Messrs. Ship Carbons, Ltd., write stating that with regard to "Monowatt" metal-filament and carbon lamps, they desire to make it clear that they do not represent the "Watt" Electric Incandescent Lamp Works for lamps of less than 16 volts, as used for battery lamps, &c. With further reference to the same notice, The London Commercial Electrical Stores, of 65 and 67, Knightrider Street, E.C., inform us that they continue to hold the sole agency in the United Kingdom for "Watt" Vienna metal and carbon-filament lamps for batteries and accumulators, of which they hold well-assorted stocks in London.

Mr. J. G. Wilson, of Manchester, and 70, Wood Street, Liverpool, has been appointed representative for Lancashire for Messrs. Harry Wittusen & Co., 27, Shoe Lane, London, E.C., for their electrical glassware.

Bankruptcy Proceedings.—W. R. N. Gard, electrician, West Ealing (Orchard Electrical Works, Canterbury).—First meeting November 27th at 14, Bedford Row, W.C.; public examination November 28th at Brentford.

The Tube Trade.—Wrought-iron tube makers in South Staffordshire and the Midlands last week reported a remarkable state of prosperity. The *Standard* said that orders were pouring in from all sources, and immediate extensions of works were being contemplated to overtake the demand. The explanation of the sudden activity was believed to be the expectation entertained by buyers that success would still attend the makers' efforts to form an All-England Association. On 14th inst. some makers declared that they were losing £2 per ton on certain classes of tubes, and tempting offers were made to consumers for contracts extending over the whole of 1912.

Lamp Works in Belgium.—New works for the manufacture of incandescent lamps are being established at Saint Josseten-Noode by La Société Métal et Lumière.

LIGHTING and POWER NOTES.

Abingdon.—As the outcome of a public desire for the E.L., the T.C. has decided to go into the matter and report, and a Committee formed for this purpose has been given power to expend £50.

Ashtead.—The Council has accepted the tender of the Leatherhead Electric Supply Co. for additional public lamps at £3 10s. each, and £2 16s. each per annum for lighting.

Atherton.—The U.D.C. has decided to erect a sub-station near Four Lane Ends, to allow of a supply of electricity to that district.

Barnsley.—The T.C. has received the sanction of the L.G.B. for a loan of £12,500 for extensions at the electricity works.

Birstall.—The Council is applying in the next Parliamentary session for the enlarging and transfer of its lighting order. It is proposed to transfer this order to the Electrical Distribution of Yorkshire, Ltd.

Bolivia.—A new hydroelectric power plant was inaugurated at Achachicala, near La Paz, on July 19th. This provides for the supply of 3,000 H.P., or 4,500 H.P. when needed, in the form of three-phase current at 6,000 volts delivered to Callapampa, where it is in part transformed to 500 volts D.C. for electric railways, and partly transmitted underground to the city for transforming to 120 volts for the general supply. After passing through the hydro-electric plant, the water is filtered for domestic supply in the city. The work has been carried out by the Bolivian Rubber and General Enterprise Co., Ltd., with offices in London, at a cost exceeding £360,000; its value may be gathered from the fact that coal has cost as much as £12 per ton in La Paz.

Bootle.—The White Star Co. has leased extensive premises in Rimrose Road, Bootle, and will convert the place into a large laundry, fitted up with the most modern type of machinery, electrically-driven, the power being supplied by the Corporation.

Bo'ness.—The National Electric Construction Co., contractors under Bo'ness T.C. for the lighting of the burgh, has published a notice of its intention to promote a Bill to confirm agreements entered into with consumers under the hire-wire system. Most of the premises in the burgh using the electric light have fittings supplied by the company, for which they pay a rental. A recent decision has raised the question of the legality of these agreements, and the object of the Bill is to legalise charges for rental for the use of the electric lines and fittings and for current. Twenty other lighting authorities are said to be parties to the promotion of the Bill.

Brighton.—With reference to the Bill to be promoted by the I.M.E.A., seeking powers for local authorities to provide and fix electric wiring and fittings upon consumers' premises, the engineer has recommended the T.C. not to support the Bill in its present form, as he is of opinion that the actual wiring and supplying of fittings on consumers' premises is work which would be better left to private enterprise, and should not be undertaken by municipal authorities. The Lighting Committee, however, has resolved that, subject to a sufficient number of Corporations agreeing to contribute towards the cost of promoting the Bill, the Brighton T.C. will contribute.

Bucklow.—The R.D.C. has approved of the proposed extension of the E.L. lighting area by the Altrincham T.C.

Bury.—At a meeting of the Electricity Committee held on the 17th inst., it was decided to fix at the new electricity works, a tablet recording the fact that the site of the works was formerly the site of Chamber Hall, the birthplace of Sir Robert Peel. The tablet will also bear the names of the members of the Committee and information as to the date of the opening of the new works, which has been fixed for the 30th inst.

Cheddar.—Steps are being taken by a syndicate formed by Mr. J. J. Bellamy, of Weston-super-Mare, to provide a supply of electricity for the town. The charges will be 6d. per unit for lighting, and from 2d. to 3d. per unit for power.

Chesterfield.—The Electricity Committee has recommended the T.C. to apply to the L.G.B. for a loan of £7,000 for additions to the plant at the electricity works.

Continental Notes.—FRANCE.—La Compagnie Générale Française et Continentale d'Eclairage has secured a concession for the supply of electrical energy for lighting and power purposes in the town of Alencon (Orne).

HUNGARY.—The Commercial Bank, of Buda-Pesth, is interested in a scheme to put down a plant to utilise the water-power of the River Drau, near Perlack, in the generation of electrical energy for lighting and power purposes.

Fife.—A complete electrical installation has been established by the Townhill (Dunfermline) Collieries Co., at No. 7 pit, Townhill; everything will be driven electrically, winding, haulage, pumping, &c., and it will, therefore, be one of the few smokeless pits in Scotland. The output will be raised from 220 to 440 tons per day.

Glasgow.—The Clyde Valley Electrical Power Co. purposes extending its cables to the north-west of Glasgow, and has asked the T.C. for permission to lay the cables through part of the municipal area. The Electricity Committee has raised no objection, and the Corporation has given the necessary sanction provided (1) that the company undertakes not to supply any energy within the city area, and (2) that the permission now granted is not used as an argument for getting authority to lay down additional cables or supply electrical energy within the city boundaries.

A contribution of £50 has been voted by the T.C. towards the guaranteed fund of £3,000 in connection with the promotion of a private Bill in Parliament, under the auspices of the I.M.E.A., for the amendment of the Acts relating to electric lighting.

Grays.—The U.D.C. has decided to improve the public lighting by replacing 81 50-C.P. tantalum lamps with single 50-C.P. tungsten lamps, and 100-C.P. tantalum lamps with single tungsten lamps of similar candle-power. The alteration will save £148 per annum.

Great Harwood.—A further meeting of the U.D.C. is being held to discuss the electricity scheme.

The Council has given formal notice of its intended application to the B. of T. for an order authorising it to supply electricity within the urban district.

Greenock.—At its meeting on November 21st, the T.C. agreed to give notice to the Scottish Office authorities and others interested of its intention of borrowing a further sum of £20,000 for the erection of additional plant, &c., at the electricity works. In answer to a question as to when borrowing was to cease, Mr. J. W. Bailey explained that the extensions now required had all been sanctioned by the T.C., which was under certain contracts for electricity and must meet its obligations. It was explained that in addition to contracts already arranged the electricity department continued to receive numerous new applications for light and power, among the latest being one from Messrs. Dunlop, Bremner & Co., shipbuilders and engineers. In connection with this application, the burgh electrical engineer reported that in order to provide a H.T. supply from the Dellingburn works to the firm's premises, an expenditure of £3,700 would be necessary, and that to make the proposition remunerative it would be necessary for the firm to guarantee an annual payment of not less than £750 for 10 years. In the event of the firm agreeing to the T.C.'s terms there is a probability of the question of the supplying of the whole of the Port Glasgow area—on the boundary of which the firm's yards are situated—being reopened.

Harold Wood.—The Romford R.D.C. has consented to mains being laid in the parish by the Electrical and Engineering Supplies Co., Ltd., subject to the company erecting a power station within 18 months.

Hastings.—Mr. Hooper, of the L.G.B., held an inquiry a few days since into the application of the Council for a loan sanction for proposed expenditure of £621 for an extension of mains to the West Hill district. Mr. C. E. Botley, engineer of the Hastings Gas Co., opposed the application as a ratepayer on financial grounds. In support of the application, it was urged that the proposed extension would be profitable, as 11 new consumers had been obtained, and in addition, 16 public gas lamps would be converted for electric lighting. The charge made to the Public Lighting Committee by the Electricity Committee was £3 5s. 8d. per lamp, although it was shown that the actual cost was only £1 14s. 3d. per lamp. Mr. Botley submitted that the undertaking was being carried on in a reckless manner, and that the alleged profit only existed on paper. The town clerk pointed out that if they were not allowed to borrow money to extend mains, they could not hope to get new consumers, and it was only by obtaining an increased number of customers that the undertaking could be made to pay. In the course of the inquiry it was stated that the present outstanding debt in respect of the Corporation electricity undertaking was £94,219.

Hereford.—The T.C. has received from the L.G.B. sanction to loans of £850 for mechanical stokers; £1,000 for services; and £500 for mains.

Johnstone.—Following a public meeting to discuss the question of electric power for the town, the Council has received a deputation from the Clyde Valley Co. which explained that the company was considering coming to Johnstone. The deputation also pointed out that through its subsidiary company, the Strathclyde Co., it had the power of lighting Johnstone and supplying any person there under its own Act of Parliament. The company states that it will be prepared shortly to submit a tender indicating the rate at which it can supply current in the event of a definite quantity being arranged.

London.—MARYLEBONE.—The Electric Supply Committee has had under consideration a report from the general manager, suggesting that current for cooking be offered to any subscriber who was on the telephone system, at a rebate of 25 per cent. on the present price of 1d. per unit during April to September, inclusive, also recommending that the same rebate, but for all the year round, should be given for non-peak cooking to businesses (also being "telephone" consumers) having large installations, where a large amount of day cooking is done. The object was to encourage a big summer and non-peak cooking load at a time when the additional output cost little more than ½d. per unit. The Committee has decided to concur with these suggestions and to allow the rebates to be made as from January 1st, 1912.

ISLINGTON.—The Lighting Committee reports to the effect that it is of opinion that powers should be given it to undertake the outside lighting of business premises in the borough at a fixed sum per annum by agreement, and stating that an arrangement of this kind would be to the advantage of consumers and result in the further use of electricity for lighting purposes. It has accordingly submitted a recommendation to the effect that it be authorised to enter into such agreements, and that a sum not exceeding £250 be set aside to carry out the suggestion.

TOTTENHAM.—The Education Committee has instructed its architect to report as to the advisability of installing electric light or gas at new schools, together with the comparative cost of the two systems.

L.C.C.—The adjourned report respecting loans for electricity undertakings and the special position created by the London Electric Supply Act, 1908, were dealt with by the Council on Tuesday. Sir George Goldie moved the acceptance of the report. Taking a broad view of the present situation, and having regard to the developments of electricity supply in recent years, the Finance Committee considered that it would seem to be preferable, so far as the financial aspect of the question was concerned, for Borough Councils, where possible, as opportunity offered, to link up their undertakings for mutual support as well as for economy, instead of extending a number of comparatively small and, in some cases unprofitable concerns, which might, on economical grounds, some day have to be scrapped. It might be that such extensions necessary to fulfil the statutory requirements in regard to the supply of electrical energy could be made by a few only of the Borough Councils, who, having regard to the situation or other circumstances, were able to develop their plant and stations in a more economical manner than others. It was conceivable also that, in particular cases, it might be financially advantageous to make arrangements with a company for the supply of energy in bulk. The Committee had suggested to the Highways Committee that it should consider whether it would not be desirable for it to recommend the Council to formulate, as far as circumstances would permit, a comprehensive policy as to the action which the Council should take in view of the London Electric Supply Act, 1908. Although unable to make any proposals that afternoon, Sir George Goldie suggested that the Highways Committee might very well refer to the General Purposes Committee the question of appointing a special committee to consider the whole question of electricity supply in and around London, with particular reference to the provisions of the London Electric Supply Act, 1908. Sir John Benn said he was prepared to second a resolution to that effect if it were to be put to the vote. The report was passed.

FULHAM.—The Council has decided to take up a loan of £9,280 from the L.C.C., made up as follows:—£6,280 for generating plant and foundations; £1,000 for house services; and £2,000 for meters. About 20 modern and up-to-date transformers are to be substituted for the older type of transformers at present installed at the various sub-stations in the borough.

Lowestoft.—The Electric Lighting Committee has received a report as to the Electrical Exhibition at Olympia, and a

recommendation that a certain fitting for street lamps shown there would be very suitable for replacing some of the older forms of street lamps in the town. It is hoped that the Committee will see its way to allow a small exhibition to be held in Lowestoft during the early part of 1912, when cooking, heating and motor power would be shown to the public, as it was this load they required to make the undertaking still more successful.

Menai Bridge.—The scheme for the electric lighting of the town, which has been before the Urban District Council, is now in a likely position to be carried out, Mr. Parry, one of the promoters, having informed the Council that he is in a position to commence the work of putting down the plant. The preliminary negotiations had taken longer than he had anticipated, and for that reason the party co-operating with him feared the installation would not be finished quite at the time arranged. In view of all the circumstances, the Council acceded to Mr. Parry's request for a three months' extension of the period for the completion of the work. It seems that Mr. J. W. Williams, of Pwllfanog, had approached the Urban Council on behalf of a new party of promoters, asking what would be the Council's attitude in case they sought a provisional order. They were prepared to compensate Mr. Parry, provided he was reasonable. It was agreed that, in view of Mr. Parry's letter and the decision the Council had come to with him, it could not deal with Mr. Williams.

Nuneaton.—The T.C. has decided to support the Bill of the M.E.A. seeking powers for municipal authorities to undertake wiring work and the supply of fittings, &c., and has guaranteed £3 3s. towards the cost.

Redditch.—A L.G.B. inquiry will be held on November 24th into the application of the U.D.C. for a loan of £5,800 for E.L. purposes. With the installation of new turbines, the cost of production is expected to fall to ¾d. per unit.

Sandown.—The U.D.C. has decided to accept the offer of the Isle of Wight Electric Light Co. for street lighting for a term of three years, at a total cost of £601 15s.

Shrewsbury.—At a recent meeting of the T.C. it was stated that though there had been improvements in the high-efficiency lamps, giving the consumer a better light with less cost, the Committee still held its own in the matter of output. About £2,400 a year was being transferred to the sinking fund, and the electricity undertaking was in a sound financial condition.

Skegness.—The U.D.C. has decided to consider at a special meeting the question of applying for a prov. order for electricity supply.

Swinton and Pendlebury.—At a meeting of the D.C. held last week a letter was read from the Lancashire Electric Power Co., intimating that the directors were prepared to meet the Electricity Committee to discuss points arising out of the agreements for supply of electricity in bulk and management.

Wheatley.—The Doncaster T.C. has decided to apply to the B. of T. for a prov. order to enable the Council to supply electricity to Wheatley.

West Yorkshire.—The Electrical Distribution of Yorkshire, Ltd., is applying for the following prov. orders at the ensuing Parliamentary session: Darton and district (including Darton and Cawthorne), Rothwell and district (including Rothwell and Oulton with Woodlesford), Goole district (including Goole, Rawcliffe, Airmyn and Hook), Hoyland Nether district (including Hoyland Nether, Worsboro' and Wombwell), Wath and Ardsley.

Witham.—Steps are being taken to erect an electricity works in the town.

TRAMWAY and RAILWAY NOTES.

Ashton.—On Tuesday arbitration proceedings were commenced in private with regard to the dispute which has existed for many months between the employés of the Ashton Corporation Tramways, the Stalybridge, Mossley and Dukinfield Joint Board, and the Oldham, Ashton, Hyde and Denton Electric Tramways Co. Both sides have accepted the services of Mr. Ernest Moon, K.C., as arbitrator appointed by the B. of T. Mr. W. F. Chambers, solicitor, Denton, conducted the case for the authorities, and Ald. G. T. Jackson, the secretary of the Tramway and Vehicle Workers' Union, appeared on behalf of the men. The points for arbitration were that the hours should be 9½ per day with time and a quarter for overtime, each day to count by itself; a minimum wage for conductors of 22s. 6d. per week, rising to 27s. 6d.; for drivers a minimum of 28s. 6d., rising to 32s. 6d. per week; car-shed men's wages to be raised by ½d. per hour, annual holidays to be increased from three to six days with payment, and relief for meals of not less than 20 minutes per day to be granted to each shift of men. The proceedings were expected to last over two days.

Belfast.—At the fortnightly meeting of the Tramways Committee, a suggestion was made to have glass screens put up in front of the cars for the protection of motormen; it was pointed out that this matter had been before the Committee, and its opinion was that it would be highly dangerous, not only to the undertaking, but to the motormen themselves, to have glass screens erected.

Bradford.—The profits on the working of the City tramways for the half-year ended September 30th, the figures of which were submitted this week, constitute a record for the department. The statement shows a net profit for the period of £35,867, compared with £23,991 for the corresponding six months of last year, an increase of £11,870. The actual traffic receipts were £144,350, as against £131,885. On the expenditure side of the statement is shown a total increase of £2,500, whilst under the new arrangement between the electricity and tramways departments, whereby energy is supplied at a reduction of ½d. per unit, there is a decrease in cost of power of £2,609 on an expenditure for this purpose of £21,506, or 1·7d. per car-mile, as against £24,116, or 2·0d. per car-mile last year.

Brighton.—On Thursday last week the T.C. passed a resolution, by 41 votes to 1, in favour of obtaining power to run a railless trolley service in Brighton, Hove, Portslade, Southwick and Shoreham.

Conway.—A proposal is under consideration for the construction of a light railway along Conway Valley, to run on the opposite side of the river to the existing railway. The estimated cost of the scheme is £75,000.

Continental Notes.—TURKEY.—It was recently reported that the Turkish Ministry of Public Works had concluded an agreement with the Berlin firm of Lenz & Co., for the construction of an electric railway in Constantinople, which is to involve an expenditure of about £4,000,000. A Constantinople correspondent has now forwarded to a Frankfort newspaper some details in relation to the concession, which is for a period of 75 years. The railway is to begin in the centre of Stamboul, and then proceeds to the High Porte, and thence to the Golden Horn. Crossing this arm of the sea by means of a new bridge, the railway will rise over Galata to Pera, and will be carried on the heights along the Bosphorus for about 20 miles to the Black Sea. The holder of the concession undertakes to construct and work the railway at his own expense, the plans being subject to the approval of the Ministry of Public Works. Work has to be commenced within three months of the sanction of the plans, and the railway is to be completed to Sari-Yer in three years, and to the terminus in eight years. A Turkish company is to be formed by the concessionaire one year after the ratification of the agreement, and one-half of the shares is to be placed at the disposal of Turkish subjects. The right of expropriation for the construction of the railway is granted. If the Constantinople city authorities should resolve on the formation of streets along the route of the railway, the concessionaire agrees to construct them for the account of the city, and to charge the costs and 4 per cent. interest on the profit share of the city in the working results. The line from Galata to Aranut is to be of double track at the beginning, but the question of a second track for the remainder of the railway is left open, although the land for the purpose is to be acquired at once. All the materials necessary for the construction of the railway, including the rolling stock, will be admitted free of duty, and the fares will be subject to the approval of the Government and the city authorities. As far as the gross receipts are concerned, the correspondent states that the working expenses and cost of maintenance, together with the annual charge of 5 per cent. for redemption and interest on cost of construction, are to be deducted first. If the annual receipts do not cover the working expenses, the concessionaire has no right of claiming compensation, although he is entitled to carry the deficiency to a special account, and charge it with 4 per cent. interest. If, however, the gross receipts are higher than the charges in question, the difference is to be regarded as net profits, and to be devoted to the extinction of the deficiency account. The balance then remaining is to be divided with the city authorities, who are to receive 20 per cent. if the annual net profits amount to £400 per kilometre, 35 per cent. if they range from £400 to £800, and 50 per cent. if they exceed £800 per kilometre. If the deficiency in the working receipts has not been extinguished when the concession expires, the concessionaire has no claim to compensation. On the lapse of the period of the concession, the city authorities acquire all the rights of the concessionaire in the railway, power stations and accessories. The latter is under the obligation to hand over the railway to the Government in good condition and free from any debt. If this obligation is not, or is only partly, fulfilled, the Government has the right to collect the railway receipts five years before the expiration of the concession, and employ them for the maintenance of the line. The Government reserves the right to acquire the whole or any portion of the rolling stock and the "stocks" in the stations on the basis of an estimate prepared by experts, and the purchase price is to be paid six months after the transfer. The Government has also the right of acquiring the undertaking at any time from the fifteenth year after the opening of the whole of the railway. It is further provided that the workmen and officials are to be Turkish subjects, although foreigners may be conditionally employed for technical work in so far as suitable Ottoman subjects cannot be obtained.

FRANCE.—La Compagnie des Chemins de Fer Departementaux de la Haute-Vienne has secured the concession for the construction and working of 350 km. of electric railways in the Department of Haute-Vienne. The lines will be on the monophase system.

An electrical motor dust cart has just made its appearance in the streets of Paris. It is being experimentally tried by the sanitary department of the municipality, and if it is successful, vehicles of

the new type will displace the insanitary horse-drawn dust carts hitherto employed.

Dewsbury.—The Corporation has given notice of its intended application to the B. of T. for an order authorising the construction and working of a double line of tramway in Halifax Road, Willans Road, Moorlands Road, Boothroyd Lane and Staincliffe Road.

Falkirk.—The Falkirk and District Tramway Co. proposes to apply to Parliament for an extension of time for carrying through the extension of the electric tramway system to Grangemouth. In 1906 the company obtained powers to connect Grangemouth, amongst other places, with its system of tramways, and five years was allowed to give effect to the powers obtained. Up till now the Grangemouth extension is the only portion of the original scheme which has not been proceeded with. Under its new order the company asks for another three years—the maximum time allowed—to complete the scheme. As a line to Grangemouth would be remunerative, it is believed the extension will not be long delayed.

Glasgow.—At its last meeting, the T.C. dealt with the Committee's report on tramway facilities for the blind published in last week's REVIEW. The convener pointed out that the Committee was willing to recommend that the blind should travel free on the cars by passes, and it was anxious that the distribution of these passes should be undertaken by a committee of the blind themselves. The only question now to be settled was that of conditions, which would be reported to the Corporation for approval. The passes would be applicable over the whole tramway system.

The recent strike of tramway employés of the T.C., and other strikes in Glasgow, were responsible for the consideration of a proposal by that body at its last meeting. The proposal asked for the appointment of a committee to report what steps should be taken to prevent or discourage strikes, and to confer with other authorities as to the alteration in the existing law which might be considered necessary for the better protection of all public services and property under municipal control.

There is every prospect of the T.C. putting the confirmation on the proposal to double the length of the present ½d. stage on its tramway system. The matter was opened up from the practical point of view by the success which attended the "two-stage" experiment—*i.e.*, a species of return ticket, by which two double ½d. stages were given for 1½d. The T.C. some time ago remitted the question of increasing the ½d. stage to the Committee for consideration and report, the Lord Provost giving the assurance that that course was practically only a matter of form. The Finance Sub-Committee and the Tramways Committee have reported favourably, and the expectation is that—the T.C. agreeing—the new system will come into operation next month.

Hartlepool.—The Corporation proposes to expend £56,000 on the tramway, this includes the purchase of several routes from the present company, and also the laying of two miles of extra track, and the purchase of six new cars, &c.

Leith.—A provisional order is being applied for to construct electric railways between the coal shipping docks at Leith and the leading collieries in East and Mid Lothian. A company has been formed of colliery owners and others, and a sum for preliminary expenses of £10,000, is subscribed. There will be four lines. One from Leith to Prestonpans, a distance of about seven miles, other two lines branching off, and a fourth line leading from Leith Docks to Gorebridge, in Midlothian, the longest of the four railways. Many collieries will be connected up in this way direct with Leith, where the coal shipments last year totalled about 1¾ million tons. This project, if carried out, will be the first of its kind in Scotland.

London.—METROPOLITAN ASYLUMS BOARD.—It is proposed that an agreement should be entered into with the Tudor Accumulator Co. for the maintenance of the battery of the new 30-cwt. electric vehicle at Queen Mary's Hospital. Two agreements had previously been entered into with this company (who were the makers of the batteries), one for the maintenance of the battery of the small 5-cwt. vehicle purchased at the opening, which was worn out and no longer in use, and the other for the 25-cwt. car battery. The first agreement provided for an annual payment of £10 (to cover any number of vehicles up to six), and ¾d. per mile run. For the 25-cwt. car, 1½d. per mile run was charged, and for the new vehicle the charge would be 1½d. per mile.

LEWISHAM.—Intimation has been received from the L.C.C. that it proposes at an early date to proceed with the construction of tramways from London Road to Park Road, Forest Hill, and from Forest Hill to Rushey Green.

London Electric Railway Proposals.—A scheme has been prepared by the District Railway, under which powers are to be sought to double the line between East Putney and Wimbledon Park, thus enabling the District Co. to use its own track instead of, as at present, having the joint use of the L. & S.W. Co.'s line between the points mentioned. This scheme will give a greatly increased electric railway service between Wimbledon and the City.

The Central London Railway has decided to seek powers to extend its line, in connection with the Shepherd's Bush-Ealing (G.W.) line which is under construction. The proposal is for a loop line running from Goldhawk Road through Turnham Green, under Kew Bridge, and round by Isleworth and Hounslow, to the Ealing line. The Bank to Liverpool Street extension of this company should be opened next June, and the Ealing line six months later.

The Metropolitan Railway also has a project, for which Parliamentary powers are to be sought, to provide a branch from its main line at Rickmansworth to the Cassiobury Park side of Watford, in connection with which the electrification of the line will be extended from Harrow to Watford. A simultaneous widening of the line between Wembley and Finchley Road will enable a frequent service of non-stop trains to be run. The same company proposes to link up its Hammersmith and City line with the Central London extension mentioned previously.

The Great Eastern Railway Co. is asking for Parliamentary powers in connection with the East London Railway electrification, the capital for which may be found by the leasing companies.

Last week we noted the fact that a definite proposition for electrifying the North London Ry. had at last been made. Later information shows that the scheme is part of a comprehensive proposal by the L. & N.-W. Railway, which in 1907 commenced a scheme for widening its main line from Kilburn to Watford, with a connecting tube between the former station and Euston, where a low-level station was to be constructed. We understand that the tube portion of the scheme has now been abandoned, and the new scheme comprises the construction of two extra lines between Watford and Chalk Farm, and the electrification of two of the four lines between Chalk Farm and Broad Street, thus giving direct communication between Watford and the City. Such portion of the electrically-worked traffic as passes to Euston will be worked over the existing lines. At the same time the Bakerloo tube is to be extended to Queen's Park on the North-Western line, and in this way Watford will be linked up with Paddington, Marylebone, Piccadilly, Waterloo, &c., and all the railways which connect with this tube, over which through trains will be run.

The North London electrification includes the section from Willesden to Kew and Richmond, a portion of which route is already in use by the District Co.'s electrical trains; also the Earl's Court-Willesden line, which the North-Western Co. operates by means of steam trains. As regards the North London line, it is instructive to note that the passenger receipts have steadily declined from £311,400 in 1902 to £198,000 in 1910, owing to the increasing tube and tramway competition. The scheme avoids congestion at Euston, and incidentally gives to Watford a prospective electric service to three points in the metropolis.

Morley.—The T.C. has applied to the B. of T. for an extension of time to December 31st, 1912, for the completion of the works authorised by the Light Railway Order, 1901.

Newcastle-on-Tyne.—According to our Tyneside correspondent, the officials of the Corporation tramways have been experimenting with a new form of brake for cars which the engineer (Mr. Ernest Hatton) has invented. The purpose of the brake is to prevent a tramcar from running away in the event of the usual two brakes failing. The brake takes the form of a slipper or skid the entire length of the car, and is held in position from the truck. This slipper is fitted with a crescent-shaped toe. In the case of an undue speed getting on to the car the brake can easily be operated by either the motorman or conductor. As the brake is put in use the slipper falls to the ground, and drums, which are fixed to the inside of the wheels, and which revolve at the same time, come into play on the rising toe of the brake. By this means the running wheels are lifted sufficiently off the ground to leave the rails, and the way is almost immediately taken off the car. The principle has worked exceedingly well in experiment, and tests are being continued.

Newcastle-under-Lyme.—The R.D.C. has decided to support the North Staffordshire Railway Co. in its application to the Light Railway Commissioners, for powers to construct a light railway from Trentham to Newcastle.

Ramsbottom.—At a special meeting of the U.D.C. on the 16th inst., it was unanimously decided that a Bill be promoted in Parliament to authorise the erection of overhead equipment and other works for the installation of a system of railless traction. The Council proposes to install the system between Holcombe Brook and Edenfield Church, a distance of 3½ miles, at a cost of about £10,000.

At the special meeting of the U.D.C. Mr. Shore, who presided, stated that it was proposed to run a half-hourly service daily, from 5.30 a.m. to 11 p.m., from Holcombe Brook to Edenfield Church and from Ramsbottom market place to the Railway Station, and they would have three cars to start with. The cost would be approximately £10,000, compared with £28,000 for a rail system. He expressed confidence that the scheme would pay. The Council had been able to come to a satisfactory arrangement with regard to current, and it was proposed to erect a car-shed.

United States.—The cable plant of the United Railroads of San Francisco is now operated by electricity. Operating conditions demand that the plant shall run continuously for 20·25 hours per day, all the year through, and that a constant cable speed of 9·5 M.P.H. shall be maintained. The power installation consists of a G.E. 600-H.P., 400 R.P.M., 400-volt induction motor, with master controller and contactors, and a set of 12 cast-iron grid rheostats, the motor being mounted on a sliding base for adjustment of the transmission chain. Power is brought to the building at 11,000 volts, passing through a set of air-blast, step-down transformers, which reduce the pressure to 440 volts.—*Elec. Rev. and W. Electrician.*

Stockport.—The Corporation has given notice of its intention to apply to Parliament in the ensuing session for leave to bring in a Bill to empower it to provide railless trolley or other vehicles to run through Offerton to Marple. The Hazel Grove and Marple Councils are supporting the application.

TELEGRAPH and TELEPHONE NOTES.

An Experimental Wireless Plant.—New plant of modern design has been installed in the electrical engineering laboratories at the Liverpool University, and the department of electrical engineering has recently been equipped, through the munificence of Sir Wm. P. Hartley, with a complete installation of apparatus for the purpose of wireless telegraphy. An aerial post, having a total height of 150 ft., is being erected above the University building by members of the engineering department, under Prof. Marchant, and in connection therewith is a complete set of receiving and transmitting apparatus, by means of which direct communication with the Eiffel Tower and the North of Germany will be established. The installation is a full-scale one, and will be used for the instruction of students and for research and experimental work.

Automatic Call Meter.—It is reported from Wales that Mr. S. D. Williams has invented an automatic meter for telephone calls, which makes no record of ineffective calls, and is said to be proof against mistakes, fraud and fools.

Constantinople.—In the *Journal* of the British Chamber of Commerce of Turkey for September some particulars are given of the future telephone system, which will consist of 10,000 lines, to be ultimately increased to 18,000. The rates charged will be based on the measured-rate system, with a minimum of £T5.50 for 550 calls, for business offices; a flat rate of £T8.00 will be charged to dwelling houses, with an extra charge of one piastre (2d.) per call from one zone to another. It is expected that the installation will be completed in 20 months, at a cost of £200,000 or more.

Sweden.—Several well-known business men have petitioned the Government for a concession to build a wireless telegraph station, on the Marconi system, near Stockholm, with a radius of 1,200 miles, which will provide a regular connection between Sweden and several European and other countries and with ships on the high seas. The connection with Great Britain would be direct, and with most other countries *via* Great Britain. A company will be formed, with a share capital of £100,000. The station will be ready in a year.—*Daily Telegraph.*

Wireless Telegraphy.—Last week, for the first time, the post at Fez succeeded in communicating with the Eiffel Tower.

The wireless telegraph installation by Lloyd's at Port Said has now been completed, and from December 1st telegrams can be dispatched to any ships within the radius of the apparatus from any telegraph office in Egypt.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—New South Wales.—December 20th. One branching multiple magneto switchboard at Broken Hill, for the P.M.G.'s Department. See "Official Notices" September 22nd.

December 12th.—Ebonite earpieces, telephone cords, bronze and copper wire, Bleeck-Love cells and charges, and telephone material, for the P.M.G.'s Department. See "Official Notices" October 20th.

January 3rd, 1912.—Sixty-nine switchboards, magneto, non-multiple, for the P.M.G.'s Department. See "Official Notices" to-day.

Melbourne.—December 19th. Deputy P.M.G. 2,750 rolled steel beams for use as telegraph and telephone poles (Sched. 579), 8,320 protectors and 16,640 fuses for main distributing frame (Sched. 619). Specifications, &c., High Commissioner in London, 72, Victoria Street, S.W., and at Board of Trade Commercial Intelligence Department.

South Australia.—January 3rd. One wire-testing machine, for the P.M.G.'s Department. See "Official Notices" to-day.

N.S.W. Government Railways.—December 4th. Two return boosters. January 8th, 1912.—Four 1,000-kw. rotary converter units. January 22nd, 1912.—Supply and erection at the White Bay power house, Sydney, of eight water-tube boilers, with superheaters, economisers and mechanical stokers. January 29th, 1912.—A 25-kw. booster set. Particulars, Electrical Engineer's Office, 61, Hunter Street, Sydney.

Belgium.—December 5th. The Secrétariat Général de l'Administration des Hospices, of Brussels (Boulevard Botanique, Hopital St. Jean), is inviting tenders for the supply and installation of two electrically-operated lifts in the St. Pierre Hospital, Brussels.

December 7th.—The municipal authorities of Lambermont (Verviers) are inviting tenders for the electric lighting of the town.

Blackpool.—November 29th. One 1,500-kw. steam turbo-alternator, one barometric jet condenser, and one 800-kw mixed-pressure steam turbo-generator, for the Corporation. See "Official Notices" November 10th.

Clayton-le-Moors.—December 2nd. Repair and maintenance of fire brigade alarm system for a year, for the U.D.C. Hon. Superintendent of the Fire Station, off Pickup Street.

Dewsbury.—November 30th. 3-h.p. electric motor for driving a kneading machine. Further particulars from the Master of the Workhouse.

Darlington.—December 4th. 500-kw. d.c. dynamo coupled to a reciprocating steam engine, for the Corporation. See "Official Notices" November 17th.

Edinburgh.—Edinburgh and District Tramways Co., Ltd., invite tenders for electric light supplies, &c. C. H. Shepherd, manager.

France.—March 12th. Tenders are invited for the installation and working of an electric ship-towing service between Etrum and Janville on the Upper Scheldt along the St. Quentin and Oise Canals. Particulars, Service Spécial de la Navigation entre la Belgique et Paris, in Compiègne, Rue de l'Aigle 5.

Germany.—December 5th. The Prussian State Railway authorities at Paderborn are inviting tenders for the supply of three electrically-operated travelling cranes.

London.—Fulham.—The B.C. is to spend £1,000 upon 20 modern transformers for sub-stations, to replace the older type at present installed.

Neath.—November 25th. Small steam coal for a year, for the electricity generating station of the R.D.C. G. H. Thomson, electrical engineer, 12, Green Street, Neath.

New Zealand.—February 7th, 1912. Napier Corporation. (1) Permanent way, overhead work and supply mains; (2) power station, car-shed and repair-shop equipments; (3) rolling stock. Deposit 2½ per cent. Specifications can be seen at the Board of Trade Commercial Intelligence Branch in London.

Norwich.—November 27th. Two water-tube boilers, for the Corporation Electricity Department. See "Official Notices" November 17th.

Norway.—January 31st, 1912. The Norwegian military authorities in Christiania are inviting tenders for the supply of 100 sets of field telephone apparatus.

Rotherham.—November 30th. Tramway uniforms, for the T.C. W. J. Board, Town Clerk.

Salford.—November 27th. Two 1,000-kw. direct-current turbo-generators, for the Corporation. See "Official Notices" November 3rd.

Electrical equipment of the Infirmary, for the B.G. Lacey, Sillar & Leigh, engineers.

Siam.—December 30th. Tenders are invited for five electrically-driven centrifugal pumps for the waterworks at Bangkok. Particulars, Local Sanitary Department, Bangkok.

Bangkok.—March 15th, 1912. Tenders are invited for the supply and erection of an electric power station with a capacity of 3,000 kw. Tenders, on the prescribed forms, to the Ministry of Local Government, Bangkok. Correspondence and inquiries to Mr. F. B. Shaw, engineer-in-charge, Municipal Electric Power Station, Local Sanitary Department, Bangkok. Tenders must include a sum in respect of import duties, calculated at 3 per cent. on the value c.i.f. Bangkok of all plant and materials. A copy of the specifications, &c., may be seen by British contractors at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.—*Board of Trade Journal.*

Spain.—December 6th. Tenders are being invited by the municipal authorities of Pedro Bernardo (province of Avila), for the concession for the electric lighting of the town during a period of 20 years.

Tenders have just been invited by the municipal authorities of Amusco (province of Palencia) for the concession for the electric lighting of the town during the period of 10 years.

Trimdon Grange (Co. Durham).—December 9th. Electric fittings for a year, for Walter Scott, Ltd., Trimdon Grange Colliery; the Storekeeper.

Uruguay.—February 6th, 1912. Tenders are invited by the Port Authorities at Monte Video for the supply of 13 electric cranes, together with 600 metres of steel rails. For further particulars, see this column for October 27th.

Warrington.—November 28th. Low-tension cable, for the Corporation Electricity Department. See "Official Notices" November 17th.

West Ham.—December 4th. Electric light installation at the Gainsborough Road Schools, for the Corporation. See "Official Notices" November 10th.

CLOSED.

Atherton.—The D.C. has accepted the tender of Callender's Cable and Construction Co., Ltd., for about 880 yards of concentric high-tension paper-insulated lead-sheathed cable, also that of Messrs. Hanchett, Barrett & Co., for two transformers.

Australia.—According to the *Australian Mining Standard*, the following contracts have been placed by the Government Departments mentioned :—

Queensland.—Postmaster-General :
3,590 yards of lead-covered cable, at £360 per mile.—W. T. Henley's Telegraph Works Co., Ltd.
1,070 conduits at 3s. 8d. each, and 864 conduits at 2s. 8d. each.—James Campbell & Sons, Ltd.
70 miles tinned copper wire, No. 20 S.W.G., at £2 19s. 6d. per mile.—Armorduct Manufacturing Co.
90 miles twisted pair wire, at £22 per mile; 80 miles twisted pair wire, tinned annealed copper, at £17 7s. 6d. per mile; 20 miles tinned copper wire, at £8 4s. 6d. per mile.—W. T. Henley's Telegraph Works Co., Ltd.
1,700 wall telephones, at £2 11s. 6d.; 250 table telephones, at £2 18s. 8d. each; 200 wall magneto telephone sets, at £2 16s. each.—James Paton & Co.

South Australia.—Postmaster-General :
100 cast-iron covers and frames for manholes, at £1 15s. each.—R. Kennedy and Sons.
1,500 conduits at 4s. 4d. each and 11,800 at 2s. 10d. each, and 9,000 pipes at 10d. each.—G. R. Marks.

Tasmania.—Postmaster-General :
5 miles of wire at £14 13s. per mile, and 80 miles at £7 1s. per mile.—Armorduct Manufacturing Co., Ltd.
5 miles of wire at £22 5s. per mile, 5 miles at £13 15s. per mile, and 5 miles at £24 10s. per mile.—W. T. Henley's Telegraph Works Co., Ltd.
2,000 insulators at 3d., and 10,000 at 5d. each.—Dalgety & Co., Ltd.
1,000 insulators at 5d. each.—Western Electric Co. (Australia), Ltd.

Victoria.—Postmaster-General :
21,120 glazed earthenware conduits, £3,288.—Mills & Co.
55 tons of hard-drawn copper wire, £3,765.—Gibbs, Bright & Co.
5 miles of telegraph cable, lead-covered, paper-insulated, 50 lb. per mile, £1,180.—Callender's Cable and Construction Co.
Department of Public Works (State Shipbuilding Yard) :
Electrical generating plant, £5,074.—Gardner, Waern & Co.
Three-ton electric crane, £1,479.—Babcock & Wilcox.
One motor-generator and accumulators, at the Central Telegraph Office, Melbourne. £450.—T. K. Steanes.
Supply of wire, £3,494 15s.—W. T. Henley's Telegraph Works Co., Ltd.
Automatic switchboard, £14,293.—Automatic Telephones (Australasia), Ltd.

Belgium.—Ten concerns—seven German, two Belgian and one Austrian—last week submitted tenders to the municipal authorities of St. Gilles-lez-Bruxelles for the supply of 5,000 metres of electric armoured cable, the lowest being that of Messrs. Felten and Guilleaume, of Mulheim-am-Rhine.

Condensing Plant Contracts.—Amongst the orders recently received for steam condensing plant by the Mirrlees Watson Co., Ltd., are the following :—

Surface Condensing Plants.
One set for Messrs. Bolckow Vaughan's Steel Works, Southbank. (This makes the tenth set supplied.)
One condenser for Wesselton Mine, De Beers Consolidated Mines, Ltd., Kimberley.
Two sets for Carron Iron Works per the British Thomson-Houston Co., Ltd.
Two sets for Elliott's Metal Co.
Plant for Messrs. Ransomes & Rapier, Ltd.
Plant for Bradford Colliery, per British Thomson-Houston Co., Ltd.
Plant for Wigan Coal and Iron Co., per Messrs. Fraser & Chalmers, Ltd.

Jet Condensing Plants.
Plant for Nobel's Explosives Co., Ltd., Stevenston, per Messrs. Jas. Howden and Co., Glasgow. (Repeat order.)
Plant for Empress Mills, Nagpur, per Messrs. D. Adamson & Co., Dukinfield.
One Mirrlees-Leblanc plant for Mr. Edouard Bataille, Paris.
One Mirrlees-Edwards air pump for London Electric Supply Corporation, Deptford.

Dundee.—Messrs. G. H. Nicoll & Co. have secured the electrical contract in connection with a new school at Broughty Ferry.

G.W. Railway.—The G.W. Railway Co. have again accepted the tender of Messrs. Jones Bros. (West Bromwich), Ltd., for refined Trinidad bitumen for the next 12 months.

Hereford.—The T.C. has accepted the tender of Messrs. Wm. Cory & Son for 500 tons of Welsh small coal for the electricity works, at 10s. 6d. per ton.

Horsham.—The U.D.C. has decided to accept the tender of a Manchester firm for cables, at £295, in preference to one for Swiss cable at £265. The next lowest tender for foreign cable was £315, and those for English-made cable ranged from £354 to £390.

London.—L.C.C.—The Highways Committee received the following tenders for static transformers and switchgear for the new sub-station to be erected at Vauxhall :—

Static Transformers.

British Westinghouse Elec. and Manf. Co., Ltd.	(recommended)	£2,772
British Electric Transformer Co., Ltd.		2,803
General Electric Co., Ltd.		2,875
British Thomson-Houston Co., Ltd.		3,065
Dick, Kerr & Co., Ltd.		3,129
W. E. Burnand & Co.		3,388

High and Low-Tension Switchgear.

Switchgear & Cowans, Ltd.	(recommended)	5,030
Johnson & Phillips, Ltd.		6,194
A. Reyrolle & Co., Ltd.		6,399
General Electric Co., Ltd.		6,498
Spagnoletti, Ltd.		6,821
Electric and Ordnance Accessories Co., Ltd.		6,951
Electric Construction Co., Ltd.		7,408
Siemens Bros. Dynamo Works, Ltd.		7,450
Ferranti, Ltd.		8,079

Battersea.—The B.C. has accepted an offer from Messrs. Whipp and Bourne to supply four circuit-breakers, at a cost of £84.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named :—

Admiralty, Contract Department.
Incandescent lamps.—Edison & Swan Co., Ltd.; General Electric Co., Ltd.

War Office.
Magnetic compasses.—James J. Hicks; Short & Mason, Ltd.
Works services : installation of electric light at Guadeloupe and Martinique Barracks, Bordon.—J. B. Saunders & Co., Ltd.
Ditto, at St. Lucia Barracks, Bordon.—G. E. Taylor & Co.
Overhead conductors, supports, feeders, &c., for electric light, Bordon Camp.—J. B. Saunders & Co., Ltd.

India Office, Store Department.
Apparatus.—Elliott Bros.
Backs, &c.—Bullers, Ltd.
Batteries, &c.—Tudor Accumulator Co.
Cable.—Siemens Bros. & Co.
Fans.—Veritys, Ltd.
Generating sets.—Laurence, Scott & Co.
Insulators.—Bullers, Ltd.
Telephone sets, transmitters, &c.—Peel-Conner Telephone Works, Ltd.

General Post Office.
Fire-alarm apparatus.—A. C. Brown.
Protective apparatus, distributing fuseboards.—Johnson & Phillips, Ltd.
Heat coils, &c.—British L. M. Ericsson Manfg. Co., Ltd.
Protectors, &c.—British L. M. Ericsson Manfg. Co., Ltd.; International Electric Co.
Telephone bells.—British L. M. Ericsson Manfg. Co., Ltd.; W. Maxwell and Co.; Spagnoletti, Ltd.
Flexible cords.—British Insulated and Helsby Cables, Ltd.; London Electric Wire Co. & Smiths, Ltd.
Generators.—Siemens Bros. & Co., Ltd.
Plugs.—British L. M. Ericsson Manfg. Co., Ltd.
Switchboards.—British Insulated and Helsby Cables, Ltd.; British L. M. Ericsson Manfg. Co., Ltd.; Western Electric Co., Ltd.
Telephones.—British L. M. Ericsson Manfg. Co., Ltd.
Repair of telephones.—National Telephone Co., Ltd.
Transmitters.—Peel-Conner Telephone Works, Ltd.
Paper-core cable.—Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Submarine cable.—Telegraph Construction and Maintenance Co., Ltd.
Dry cells.—Siemens Bros. & Co., Ltd.
Morse telegraph paper.—Waterlow & Sons, Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated and Helsby Cables, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co. (incorporated in the London Electric Wire Co.) and Smiths, Ltd.
E.L., I.-R., vulcanised wire and cable.—British Insulated and Helsby Cables, Ltd.
Flameproof wire.—C. MacIntosh & Co., Ltd.
Electric lighting, Belfast Head P.O.—Craig & Paton.
Local telephone exchange equipment, North Shields Head P.O.—British Insulated and Helsby Cables, Ltd.

Keighley.—The Electricity Committee has accepted the tender of Messrs. Robson & Co., Sheffield, for a coal elevator, screw conveyor and haulage plant, at £376.

Largs.—The T.C. has accepted the offer by Messrs. Heenan & Froude to erect a two-feed refuse destructor at a cost of £2,897.

London.—Hammersmith.—The Council is purchasing from the British Electric Transformer Co., Ltd., two 250-KW. and two 75-KW. transformers, built as show transformers for Olympia Exhibition, for £330, plus eight existing old transformers of 194 KW. (estimated at £58 as scrap), which, in consequence of the change-over from arc to incandescent lighting in the main streets, are unsuitable for the ordinary supply circuits.

Lowestoft.—The T.C. has accepted the following tenders for supplies to the Tramways Department :—
Noble & Hoare.—Varnish, at schedule prices.
Stern, Sonneborn & Co., Ltd.—Car grease, 18s. 6d. per cwt.
Hadfield's.—24 rolled-steel tires, £1 18s. 9d. each.

The E.L. Committee has accepted the following tenders :—
P. Moir, Crane & Co., Ltd.—Cylinder oil, 1s. 10½d. per gallon.
Vacuum Oil Co.—Crank-chamber oil and dynamo oil, 1s. 4d. per gallon.

New Zealand.—Auckland.—City Council :—
Underground cables, £10,730; overhead cables, £546.—Noyes Bros. (Sydney), Ltd.
Feeder pillar-boxes, £280.—National Electrical and Engineering Co., Ltd.

Gisborne.—Borough Council :—
Electrical plant, switchboards and motor pumps.—British General Electric Co., Ltd.

Sandown.—The Council has accepted the tender of the Isle of Wight Electric Light Co. for public lighting for three years, at £601 15s. per annum.

Smethwick.—The T.C. has accepted the following tenders for the equipment of the depôt in Rolfe Street :—
Sisson & Co., Ltd.—Steam dynamo (120 KW. at 250 volts), complete with Sisson patent engine, rheostat, separator, &c., £797.
British Thomson-Houston Co., Ltd.—Three-panel switchboard, £104; D.C. 8-15-H.P. 250-volt motor, £89 18s.; D.C. 4-8-H.P. 250-volt motor, £15.
Mr. H. W. Ludlow, Smethwick.—Wiring, £343; fittings and lamps fixed, £208.

Carbide in Australia.—A company entitled the Carbide Manufacturing Syndicate, Ltd., is being formed in Sydney for the purpose of manufacturing calcium carbide. It is intended to erect two electric furnaces of the intermittent type, one only being used and the other kept as a stand-by. Tenders have been called for the power plant, which will consist of a 175-B.H.P. suction gas engine and producer plant, and single-phase electric generator.—*Australian M. and E. Review.*

FORTHCOMING EVENTS.

Physical Society.—Friday, November 24th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Papers on "The Maximum Value of the Electric Stress between Two Unequal Spherical Electrodes," by Dr. A. Russell; "The Magnetic Transition Point of Cementite," by Messrs. S. W. J. Smith, W. White and S. G. Barker, and other papers.

Institution of Electrical Engineers (Scottish Local Section).—Friday, November 24th. At 8 p.m. At 207, Bath Street, Glasgow. Special meeting to discuss the revision of the articles of association.

Institution of Electrical Engineers (Newcastle Local Section).—Friday, November 24th. At 7.30 p.m. At the Armstrong College, Newcastle. Special meeting *re* proposed new articles of association.

Monday, November 27th.—At 7.30 p.m. At the Armstrong College. Paper on "The Principles of Radio-Telegraphy," by Mr. Sorensen.

Manchester Association of Engineers.—Friday, November 24th. At 7.30 p.m. At the Grand Hotel, Manchester. Paper on "Coal-Cutting Machinery," by Mr. W. Bolton Shaw.

Labour Co-Partnership Association.—Saturday, November 25th. At 3 p.m. At New Masonic Buildings, High Street, Oxford. Paper on "Labour Unrest and Labour Co-Partnership," by Mr. Aneurin Williams.

Institution of Civil Engineers.—Tuesday, November 28th. At 8 p.m. Paper on "Electric Lighting of Railway Trains: the Brake-Vehicle Method," by Mr. R. T. Smith.

Institution of Electrical Engineers (Manchester Local Section).—Tuesday, November 28th. At 7.30 p.m. At the University, Manchester. Paper on "Automatic Reversible Boosters," by Mr. R. Rankin.

Institution of Electrical Engineers (London Students' Section).—Wednesday, November 29th. At 7.45 p.m. At the Institution. Paper on "Some New Zealand Electric Plants," by Mr. A. E. E. Cheal.

Northampton Institute Engineering Society.—Friday, December 1st. At 5.45 p.m. At the Institute. Open debate on "The Prospects of the Technical *v.* Practical Man."

Association of Engineers-in-Charge.—Saturday, December 2nd. Social. Dance.

Society of Engineers (Inc.).—Monday, December 4th. At 7.30 p.m. At the Institution of Electrical Engineers. Paper on "The Design of Tall Chimneys," by Mr. H. Adams.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—Col. H. M. Leaf.

The following orders are issued:—

Monday, November 27th.—"A" Company. Work same as last week.

Tuesday, November 28th.—"B" Company. Work same as last week.

Wednesday, November 29th.—Gymnastic classes, 7 to 10 p.m.

Thursday, November 30th.—"C" Company. Lecture by Major J. H. S. Phillips, 7 to 8 p.m. Technical work, 8 to 10 p.m.

Friday, December 1st.—"D" Company. Same as for "C" Company.

Saturday, December 2nd.—"D" Company. Mobilisation week-end run at Coal House Fort, Gravesend. Train leaves Fenchurch Street Station, L.T. & S. Railway, at 3.10 p.m. Dress:—Service dress, putties, great-coat, belt and haversacks will be worn.

Saturday and Sunday, December 9th and 10th.—"A" and "B" Companies. Mobilisation week-end run at Dover. Train leaves Victoria Station, L.C. & D. Railway, at 1.30 p.m. Dress:—Same as for "D" Company above.

(Signed) J. H. S. Phillips, Major,
For Officer commanding London Electrical Engineers.

NOTES.

The Tilling-Stevens Petrol-Electric 'Bus.—On Monday last we were present at a demonstration of the Tilling-Stevens petrol-electric 'bus in Kingsway, which was followed by a largely attended luncheon at the Holborn Restaurant, when the chair was taken by Richard Tilling, Esq., chairman of the well-known 'bus company which bears his name. As to the vehicle itself, we cannot add much to the illustrated description given in our issue of June 23rd, 1911, pp. 986 and 1003, and the favourable comment which an extended trial of this vehicle enabled us to give.

The London 'bus problem is mainly a financial one, and the fact that the petrol-electric vehicle above mentioned has been adopted by Messrs. Tilling—who are placing at least 150 of them on the London streets during the next 12 months—in preference to the modern petrol gear-driven type of 'bus sponsored by the London General Omnibus Co., is probably more convincing testimony to its efficiency than any amount of argument can be. We are aware that the working costs of the now well-known "B" type 'bus of the L.G.O. Co. are on a most economical basis at the present time, but we believe that the Tilling-Stevens vehicle will, in view of the experienced gained so far, show even better results than are understood to stand to the credit of the first-mentioned 'bus.

In proposing the toast of the motor-'bus industry, at the luncheon, Mr. Richard Tilling reviewed the history of the London omnibus, and claimed, contrary to the commonly accepted idea, that the taxation per passenger was heavier in the case of the motor-omnibus than the tramway. His company had decided to build a large number of Tilling-Stevens petrol-electric vehicles, and in order to meet these requirements and numerous other inquiries, premises covering 34 acres in the Midlands had been acquired, and Messrs. W. A. Stevens & Co. were removing their establishment from Maidstone to the new works. Mr. Daniel Duff (L.G.O. Co.), in replying, emphasised the necessity for uniformity in 'bus design; there were 10 or 12 different types of vehicle in use by his company, and something like 16,000 spare parts had to be handled.

Various toasts followed, amongst the speakers being Mr. W. A. Stevens, Prof. W. C. Unwin (President of the Institution of Civil Engineers), Mr. Louis Brennan, Col. Crompton, and Mr. W. M. Mordey. Mr. P. H. Frost Smith, chief engineer to Messrs. Tillings, gave some interesting figures connected with omnibus working. A few years ago when various types of motor-'bus were employed, the average cost worked out at 10½d. per mile run, while the earnings averaged only some 11d. per mile run. The most recent petrol-electric vehicle of Messrs. Tilling operated for under 7d. per mile, exclusive of depreciation, and a fleet of these vehicles should not cost more than 7½d. per mile, with all charges included. The great saving was in maintenance, which amounted on the average to 3·3d. per mile with the older type 'bus, but only came to 1·25d. per mile with the latest type. Such 'buses could safely be depreciated over a period of 10 years. He emphasised particularly the proved reliability of the petrol-electric vehicle, which owing to the ease of inspection and repair, eliminated the night work in the sheds, which was a necessity with the ordinary petrol gear-driven 'bus.

Readers who have followed our earlier articles on the Tilling-Stevens 'bus will have gathered that it represents a great practical advance in passenger road vehicle construction, and the fact of its pending commercial development on an extensive scale augurs well for the future of petrol-electric traction.

The London Electrical Engineers' Club.—The members of this Club held their first annual dinner at the Café Monico on Saturday evening last. This organisation is the Sports Club recruited amongst the members of the Electrical Engineers' Corps of the Territorial Force, and this function replaces the annual dinner hitherto held under the auspices of the Corps. After a reception by the officer in command of the Corps (Lieut.-Col. Leaf), dinner was served for about 200 members of the Club and their friends. In addition to the officers, Col. R. E. Crompton, C.B., who has recently been appointed honorary colonel of the Corps, Col. L. C. Jackson, C.M.G., R.E., Lieut.-General Sir Alfred Keogh, K.C.B., LL.D., and Prof. Dalby, of the Central Technical College, were present.

After the usual loyal toasts, Col. Jackson proposed the toast of "The Corps," and remarked on the need there was in our home defence as well as in our regular forces for the use of brains. He felt that the value of a corps such as the Electrical Engineers consisted in their willingness to contribute their special knowledge to the common good. He was aware of their record through the Boer War, and felt sure that should the need arise, what had been done once would be done again. Lieut.-Col. Leaf, in reply, pointed with satisfaction to the fact that the War Office had at last found a definite place in the Territorial Force scheme for the corps. For a long time they had been under the fear that eventually they would be disbanded and absorbed into other units. It had now been definitely arranged that they were to be responsible for the searchlights at five important ports, and there was little doubt but that eventually their duties and responsibilities would increase. He was also glad to be able to say that their old friend and late commander, Col. Crompton, had been appointed Hon. Colonel of the corps, succeeding in that position the late Lord Kelvin.—Col. Crompton said how glad he was to accept the post, as it kept in being a tie which had always given him a great deal of pleasure.

The distribution of the various challenge shields and prizes gained in the various sports competitions of the year then took place, "C" Company (Capt. Edgcumbe) winning by far the largest number. The toast of "The Visitors" was proposed by Capt. Rich (the hon. sec. of the club), and responded to by Lieut.-General Sir Alfred Keogh, K.C.B., and Prof. Dalby, and a very pleasant evening was then brought to a close. We are glad to hear such good accounts of the progress of the corps; at present it is of full strength, but there are, no doubt, many electrical engineers who would like to join. Full particulars can always be obtained on application at the headquarters of the corps, 46, Regency Street, Westminster.

Foreign Languages, or Esperanto?—Referring to Mr. J. F. C. Snell's advice to the I.E.E. Students at Manchester, to learn French and if possible Spanish, Mr. Max. J. E. Tilney writes suggesting that if, instead of these, Esperanto is studied, much wider scope is given, and a much more easily assimilated language is available. The Esperanto Engineers' Association, with headquarters at Lille, has now been established for some time, and affords the opportunity for interchange of ideas with engineers who, besides Esperanto, speak only such languages as Russian and Hungarian, which are not easily assimilated by the ordinary Briton. Mr. Tilney gives instances within his own knowledge of persons who have been able to converse with strangers speaking foreign languages, with the aid of Esperanto, and mentions that the State of California, which is starting an advertising tour on the European Continent, has organised an Esperanto Commission to deliver lectures on California in most of the large cities on the Continent, with gratifying results. Esperanto has been added to the regular teaching in the schools in many of the American States and in many European countries, while in South America, which was probably the part of the world Mr. Snell had chiefly in mind, the language is daily becoming more widely used, and Mr. Tilney has himself utilised it in correspondence with a firm in Venezuela.

Electric Portable Lamps in Mines.—At the first annual dinner of the Scottish branch of the National Association of Colliery Managers, held in Edinburgh on Saturday evening, Mr. Wm. Walker, Chief Inspector of Mines for Scotland, referred to the question of the early introduction of electric portable lamps into mines. During the past year alone, he said, they had had in Scotland no fewer than 12 fatalities caused by the ignition of gas, 11 of which occurred in naked-light pits. During the same period 94 burning accidents had occurred, and in every instance it was an open-light pit which was affected. In the present controversy as between safety and open lamps, the claims of the electric portable lamp—a most practical proposition—were being entirely overlooked. He knew of one mine where 2,000 of these electric lamps were in daily use, and he looked forward not only to an improvement in these lamps, but to a more general use of them in the near future.

Labour Union Intimidation.—We are asked to state that, as a practical step towards protecting employers and their willing workpeople against molestation and intimidation by labour union pickets during disputes and strikes, the Liberty and Property Defence League has organised a system of counter-picketing, and can supply at short notice adequate numbers of trained men, who have served in the naval, military and police forces, for the purpose of resisting the tyranny of the unions. The League is prepared to send fully-experienced ex-police officers to provincial centres to locally organise special police protection, and by prompt action make the freedom of labour safe and the rights of employers secure. Employers and others who desire to avail themselves of the services of the League in this respect are requested to communicate with the Secretary, 25, Victoria Street, London, S.W.

Parliamentary.—Rapid Transit.—Mr. W. Thorne asked the President of the Board of Trade whether he had received the report upon the Adkins Lewis system of rapid continuous transit; and whether the Government would consider the advisability of constructing such a system through the east end of London with a view to providing a remedy for the ever-increasing overcrowding of trains. Mr. Buxton replied that the Board of Trade are acquainted with the principle of the system referred to, which requires all passengers to enter and leave the cars whilst in motion. No railway constructed on this system is in actual working in any country, and considerable practical experience would be necessary before sanction could be given for the opening of a line of this description for the public conveyance of passengers.

Income-Tax and Depreciation.—Mr. Snowden calls attention to the resolution passed by the Associated Chambers of Commerce, pointing out several hardships and inequalities of the present income laws as to allowances for depreciation on buildings, machinery and wasting assets, and asks if a Committee will be set up to inquire into the whole question of a revision of the Acts which regulate the income-tax. Mr. McKinnon Wood says that the points raised are under consideration, but he is unable as yet to say whether the time has come to set up another Committee to inquire into them.

In the House of Lords on Monday the Telegraph (Construction) Bill passed through Committee and was reported; the Pacific Cable Bill also passed through Committee unamended and was reported.

Electro-Hydraulic Steering Gear.—While running her trials on the Firth of Clyde, and on her way round to the Thames, special tests were made of the installation of alternative or auxiliary steering gear of the electro-hydraulic type devised by Dr. H. S. Hele-Shaw and Mr. F. Leigh Martineau, and made by Messrs. John Hastie & Co., Greenock, with which the steam steering gear is supplemented, on board the new Orient liner *Orama*. Either type is capable of steering the ship at full speed, and the two are worked from the bridge through the same steering wheel and telemotor, either being used as desired. In the trials it was found that the gear could be easily shipped without slowing down the main engines or interfering with the vessel in any way. The power required to steer the vessel on a course was only a little over 2 H.P. This represents a great saving in a vessel of the size of the *Orama*. The absence of the lost motion between the steering wheel on the bridge and the rudder was exceedingly marked, and it was found that a very much smaller amount of motion of the steering wheel was required. Two gears of the new type have been supplied to the Austrian Lloyd for use on their new steamers *Wein* and *Helovan*, and Messrs. Hastie have three sets in hand for vessels to be propelled by Diesel engines. A first or demonstration installation has been in use on board the steam yacht *Albion* for about 18 months.

Electrical Trades Union.—On November 14th the London (West) branch held the second of its series of winter lectures. The lecturer on this occasion was Mr Forster, of the Anti-Socialist Union, taking for his subject "Socialism and Trade Unions," which provided an animated discussion adverse to the lecturer. There was a large attendance, and 17 new members were added to the ranks. Applications regarding membership should be sent to Mr. W. J. Webb, 98, Coomer Road, Fulham, S.W.

"Northampton" Past Students.—A reunion of this Association will be held on Saturday, December 2nd, at the Food Reform Restaurant, Holborn. The function will take the form of a whist drive and social, and in the interests of a successful gathering, it is hoped that every "Northampton" man will endeavour to be present. Tickets (ladies' and gentlemen's) of Mr. J. C. Rendle, 28, Oxford Road, Putney, S.W.

Automatic Telephony.—On Wednesday last a demonstration of the automatic telephone system was given by the British Insulated and Helsby Cables, Ltd., who have acquired the patent rights of the Strowger system for this country and the British Colonies. We understand that the company has taken this step only after the most mature deliberation and painstaking investigation, and that, in the opinion of the general manager, Mr. Dane Sinclair (who, as our readers will remember, was formerly engineer-in-chief to the National Telephone Co., Ltd.), the system in question is now capable of meeting all possible demands upon it. Mr. A. Brooker, electrical engineer to the company, shares this view, and the directors have determined to embark upon the manufacture of the apparatus on the largest scale, in the confident anticipation that the system will come into general use, to the supersession of the manual system. The experimental automatic exchanges which have been installed by the Post Office at Epsom and in their own building, are of the Strowger type, and we are informed that the Post Office authorities have expressed their definite intention to adopt automatic telephony. This, if confirmed, must be regarded as an extremely important statement, fundamentally affecting the whole future of the British telephone service.

The system is owned by the Automatic Electric Co. in America, and has proved highly successful in operation; already more than 300,000 telephones are in use in connection with it in the United States and Canada, and in Chicago alone 30,000 have been installed, in competition with the Bell Co.'s service. We recently published a lengthy abstract of a paper read by Mr. W. Aitken before the Institution of Electrical Engineers (Electrical Review, June 23rd and 30th, 1911), in which the system was fully described; we need not, therefore, go into details here regarding the mechanism. Suffice it to say that the operator at the exchange is totally eliminated; one subscriber calls another by an extremely simple operation, and either connection is effected within a few seconds, or the "engaged" signal is given to the calling subscriber, thus putting an end to that waste of time which is so characteristic of any manually-operated system, and is the bugbear of the telephone engineer. Only in the case of trunk calls are the services of an operator required.

It is claimed that the reduction in the cost of the service is so great, and the saving of time on the junction lines so considerable, that the adoption of the automatic system renders possible an unlimited service at a low cost, instead of the "measured rate" which is indispensable to the successful commercial operation of the manual system on a large scale. It is round this question of working and maintenance cost that the battle between the automatic and manual systems has raged; we are assured that though the original cost of the automatic equipment is necessarily greater than that of the manual, the running costs are far lower. Absolute secrecy is also a feature of the automatic, and the system can be worked in conjunction with private branch exchanges, manual exchanges, extension telephones, "coin in the slot" telephones, &c.

This new venture of the British Insulated and Helsby Cables, Ltd., is certainly of exceptional interest, and we wish it all success.

The Individual Drive of Textile Machinery.—In connection with our article in last week's issue on the above subject, Messrs. Wright & Wood, Ltd., of Halifax, write to say that about a year ago they put down 60 15-H.P. three-phase motors for driving a doubling mill in Yorkshire, and that this is as far as they know the only English mill designed entirely for individual driving from the commencement, and which depends solely for its power on an outside source (the Yorkshire Electric Power Co.).

Institution and Lecture Notes.—Association of Mining Electrical Engineers.—At a meeting of the East of Scotland branch held in Dunfermline, a paper was read by Mr. C. Augustus Carlow, Fife Coal Co., on "The Lessons to be Learned from the Electrical Mining Accidents in Scotland in 1910." The author said that of the total number of fatal accidents during the year, namely, 209, the five due to electricity gave a percentage of only 2·4. The five fatalities—two being in connection with cables, and three occasioned by switchgear—occurred with medium-pressure three-phase current. High-pressure could do nothing worse, and he believed that high-pressure would ultimately be regarded as the safer in situations where its use was permitted.

At a meeting of the West of Scotland branch at Glasgow, on 17th inst., the Branch President, Mr. A. Anderson, Motherwell, inaugurated a discussion on the subject of examinations, with special reference to those promoted by the Association. He stated that service certificates would not be issued after June of next year. An animated discussion followed.

Institution of Electrical Engineers (Scottish Local Section).—At the opening meeting of the current session, held in Glasgow on November 14th, Mr. F. A. Newington, chief engineer of Edinburgh Corporation Electricity Department, delivered his inaugural address as chairman. He said that two exhaust steam turbines, each driving a D.C. generator of 1,200 KW., had been installed at Edinburgh, and had increased the output by 77 per cent. for the same steam consumption; they showed an average saving of 22 per cent. in the coal bill and 54 per cent. for water, oil, stores, &c. He thought that if lamp makers would concentrate on the improvement of lamps from 30 C.P. upwards, they would be performing a more useful service than by trying to produce lamps of low candle-power. The maximum demand system was weak, in that it did not indicate when the maximum demand was taken. Mr. Lackie had devised a very simple system for heating and cooking supplies in domestic premises. From previous records he was able to tell the average consumption for lighting, and energy consumed beyond that was charged at 1d. This obviated the instal-

tion of a separate meter or separate heating circuits. Mr. Newington urged that the hiring powers enjoyed by gas concerns should be extended to electricity supply undertakings. Speaking of the low profits earned by British manufacturers of electrical machinery and apparatus, he pointed out that such plant could now be bought at one-fourth of what it cost 15 years ago. Dealing with labour troubles, Mr. Newington argued that the present fiscal system handicapped British manufacturers. If capital could not be profitably invested in the home market, it would inevitably go where it would have a better return. With regard to recent unrest and the need for generating stations to be guarded by military, the speaker recalled that "The Conspiracy and Protection of Property Act," of 1875, made it a penal offence for any person employed in gas or water undertakings to break a contract of service, should such breach of contract interfere with the supply of gas or water. It was the duty of the Institution to get this Act amended to cover electricity.

Physical Society of London.—At the meeting on November 10th, 1911, Prof. Silvanus P. Thompson and Prof. E. G. Coker exhibited two reflecting polariscopes for the study of optical stress in materials. Various experiments on surface tension were exhibited by Mr. C. R. Darling. A paper on "The Effects of Holes and Semicircular Notches on the Distribution of Stress in Tension Members," was read by Prof. Coker. Prof. Silvanus P. Thompson exhibited a large harmonograph for inscribing on a moving ribbon of paper the harmonic movements produced by compounding together mechanically the oscillations of two heavy pendulums. He also described his apparatus (shown in operation in the laboratory) for demonstrating the physiological effect of an alternating magnetic field, and demonstrated several experiments in acoustics.

Northampton Institute Engineering Society.—On Friday, November 17th, Mr. A. H. Perret read a paper before the above society on "The Design of Electric Power Stations." The object of this paper was to suggest certain rearrangements of plant in order to economise space. The author first dealt with some of the modern additions to power house equipment, going somewhat fully into the question of aluminium *v.* copper for the conductors in the station itself. After dealing with these additions to plant, the paper proceeded to describe various power stations in different parts of the world. From these certain deductions and suggestions were made for the design of power stations. The paper concluded with a discussion on the use of ice-making machinery for improving the load factor on the plant, and the author suggested the application of this principle to electrochemical and electrometallurgical processes. The paper was followed by an interesting discussion.

Institution of Electrical Engineers (Yorkshire Local Section).—A meeting was held on Monday evening, at which Mr. R. Hammond and Mr. J. E. Kingsbury were present as representing the Council, to discuss the new Articles of Association. It was decided to ask the Council to defer the question for a period of 12 months.

Dublin Local Section.—A meeting was held on November 14th to discuss the new Articles, and 60 per cent. of the Corporate Members in the Section signed a list of opinions adverse to the proposals.

Newcastle and Glasgow Local Sections.—Special meetings are to be held to-day to discuss the new Articles.

Birmingham Local Section.—A special meeting was held on Wednesday to discuss the new Articles with Members of the Council. An unofficial meeting had been held on October 31st, at which resolutions on the subject were passed.

Institution of Electrical Engineers (Scottish Students).—A paper on "Electric Clocks" was recently read to the members of the Scottish Students' Local Section by Prof. Magnus Maclean, of the Glasgow Technical College.

Northampton Polytechnic Institute.—The annual prize distribution, by Sir Wm. H. White, takes place on December 8th, at 7.30 p.m.

Appointment Vacant.—Showroom assistant, for the Birmingham Electric Supply Department (£100). See our advertisement pages to-day.

A Union Defeated.—We are pleased to offer our congratulations to Messrs. W. T. Henley's Telegraph Works Co., Ltd., on having completely frustrated the efforts of Trade Union agitators who, some weeks ago, brought about a strike at the Gravesend works, with the object of securing recognition for the Union. As a result of the company's firm determination, coupled no doubt with the men's appreciation of their past treatment by their employers, the struggle is now at an end, the Union scheme having failed, and Henley's have taken back all but 50 of their former employés.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Last Saturday week, at the Connaught Room, Great Queen Street, Kingsway, the staff of the headquarters of the West Ham Corporation electricity department at 84, Romford Road, foregathered to feast, and present a testimonial to Mr. W. MacKenzie, late mechanical superintendent of the generating station, Canning Town, on his leaving the West Ham Corporation's employ for that of the Charing Cross and Strand Electric Supply Co., with which undertaking he has taken up the duties of station superintendent at their principal generating station in Marshgate Lane, Stratford. The gathering was presided over by Mr. H. H. Couzens, engineer and manager of the West Ham Corporation electric supply, supported by Mr. W. A. Gilbert, mains superintendent; Mr. F. Farndon, sales manager; Mr. W. F. Edgerton, assistant sales manager; Mr. J. Allan, Mr. MacKenzie's successor (who before going to West Ham was mechanical superintendent at the Glasgow Corporation's Dundas Road generating station), Mr. Seddon, Mr. Bendix and other heads of departments of Romford Road and Canning Town. At the close of the dinner, the chairman presented the goodwill and parting offerings of those present, which took the form of a silver cigarette case, match box and sovereign purse, to Mr. MacKenzie, as slight marks of regard, and wished him success in the sphere of larger responsibility into which he had recently entered. Mr. MacKenzie responded, and in the course of his speech he thanked Mr. Couzens for the many kind bits of advice and guidance which he had received from him during the tenure of his position at Canning Town, and concluded by asking those present to extend to his successor, Mr. J. Allan, all the guidance and assistance that had been given to him whilst in West Ham. Mr. Allan, in a brief speech, acknowledged the kind welcome accorded to him. After appropriate music and harmony (Messrs. J. Smith, H. B. Johnson and F. J. Delves being amongst the contributors), the gathering terminated. Mr. H. B. Johnson carried out the arrangements connected with the function.

According to an Australian exchange, Mr. F. McPhail, works engineer of the electric light department of the Sydney City Council, recently resigned, and a successor was to be appointed at £300 per annum.

Tramway Officials.—Mr. F. J. Ayliffe, the manager of the tramways system in Taunton, has severed his connection with the Taunton company, and he left England on 17th inst. for Melbourne, Australia. Before going to Taunton, Mr. Ayliffe was employed by the Bristol Tram and Carriage Co., Ltd. He was first employed in Taunton as foreman, a position which he held for seven years, ultimately succeeding Mr. Smith as manager. Mr. Ayliffe and his family were the recipients of many valuable presents.

General.—Mr. Fred. E. Hinton, who for the last 3½ years has held the post of superintendent of the Electric and Ordnance Accessories Co., Ltd., at Cheston Road, Aston Manor, Birmingham, and who is leaving to take up a position at the London office of the company's principals, Messrs. Vickers, Ltd., was the guest of the evening at a smoking concert, which was largely attended by the heads of departments, general staff, foremen and outside engineers of that company, and held at the Imperial Hotel, Birmingham, on 13th inst. Mr. J. D. Morrison, secretary and commercial manager, was in the chair, and presented Mr. Hinton with a gold albert, which had been subscribed for by those present. The chairman was supported by Mr. Jacobsen (head of fan department), and Mr. Willmott (assistant works manager). The musical programme was contributed to by the following members of the staff:—Messrs. Bowen, Watt, Garrett, Partridge, Sparrow, Rooke, MacNamara, Downie and Taylor.

The Marquess of Tweeddale, who is prominently associated with a number of the submarine cable companies, is ill with bronchitis

The *Times* states that Prof. Andrew McWilliam, A.R.S.M., M.Met., Professor of Metallurgy in the University of Sheffield, has been appointed by the Government of India to the newly-created post of Metallurgical and Analytical Inspector of Steel in India. We recently published a British Association report by Mr. McWilliam on "The Present Position of Electric Steel Melting."

Mr. J. G. Lobrain, chartered patent agent, has removed from Norfolk House, Norfolk Street, W.C., to Staple Inn Buildings, High Holborn, W.C.

Mr. W. Walter Hughes, after 12 years with the British Westinghouse Electric and Manufacturing Co., Ltd., has terminated his connection with the company, and he will in future devote himself entirely to private practice as an electrical, mechanical and mining engineer, specialising in mining equipments, with headquarters at 5, Dowgate Hill, Cannon Street, London, E.C., and branch offices at Cardiff and Swansea. The style of the business will be Wm. Walter Hughes and Associates. Mr. Hughes occupied the position of assistant sales manager to the Westinghouse Co. in Manchester, and more recently was manager of their plant department. He also occupied the position of the company's manager for South Wales for eight years, and had great experience in connection with the application of electrical power in the coalfields there. Prior to his connection with the Westinghouse Co. he was engineer to Messrs. Crompton & Co., Ltd., and later their manager in Cardiff. Mr. Hughes enters upon his new enterprise with the best wishes of many friends.

Mr. J. Horsnell May has voluntarily resigned his position as chief engineer to the Electrical Power Storage Co., Ltd. Mr. May has been in the service of the company for nearly 19 years in the successive positions of laboratory superintendent and chief chemist, as works superintendent, and finally as chief engineer. Letters should be addressed to 21, Donovan Avenue, Muswell Hill, N.

The J. L. Manufacturing Co., Ltd., having amalgamated with Submersible Motors, Ltd., Mr. T. L. Reed-Cooper, managing director of the J. L. Co., has been appointed managing director of the amalgamated concern, which at an early date will alter its name to Submersible and J. L. Motors, Ltd.

Mr. Philip Monson, who has been for 35 years lighting engineer to the Borough Council of Kensington, has, on medical advice, asked to retire.

Mr. Wm. C. Jeary has left the General Electric Co., Ltd. (vacuum cleaner department), and is now appointed general manager of Magic Appliances, Ltd. (Magic suction cleaner), 6, Farringdon Avenue, E.C. Telephone, "Holborn 6525."

Obituary.—Sir Cuthbert Quilter, Bart.—We regret to record the death of Sir Cuthbert Quilter, which occurred on Saturday last at Bawdsy Manor, Woodbridge, at the age of 71 years. For between 40 and 50 years Sir Cuthbert had been prominently connected with financial affairs in the city and on the Stock Exchange. He was one of the founders of the National Telephone Co., in which he is said to have had a large interest, and he had been connected with the pioneering telephone companies which preceded the National. He remained a director of the National Co. to the last. The deceased baronet was also for some years a director of the Edison & Swan United Electric Light Co., Ltd.

Many of our readers will desire to join with us in expressing sympathy with Mr. Francis Teague, the city electrical engineer of Bath, whose wife passed away recently. Mrs. Teague had had a prolonged illness, from which she recovered somewhat in June last.

NEW COMPANIES REGISTERED.

Romolite, Ltd. (118,626).—This company was registered on November 16th, with a capital of £1,000 in £1 shares, to carry on the business of electricians, electrical engineers, manufacturers of and dealers in electrical machinery, &c., and to acquire and turn to account any invention relating to the production, treatment, storage, application, distribution, manufacture and use of metallic substances, filaments, electricity and any apparatus therefor. The subscribers are:—J. L. Elliot, Capel House, New Broad Street, E.C., mining engineer, 10 shares; A. Bonnin, 22, Royal Avenue, Chelsea, S.W., barrister, 1 share. Private company. The number of directors is not to be less than two or more than seven; the first are J. L. Elliot and A. Bonnin; qualification, one share; remuneration as fixed by the company. Registered office, Capel House, New Broad Street, E.C.

Coverwell, Ltd. (118,596).—This company was registered on November 15th, with a capital of £100 in £1 shares, to carry on the business of manufacturers of the non-conducting material known as "Coverwell." The subscribers (with one share each) are:—F. E. Bristowe, 11, Tothill Street, Westminster, S.W., managing director; V. Parker, 49, Denmark Villas, Hove, director. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first. Registered office, 20, Tothill Street, Westminster, S.W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Electrical and Engineering Supplies Co., Ltd. (99,423).—Return dated September 12th, filed October 16th, 1911. Capital £1,000, in 950 preferred ordinary shares of £1 each, and 1,000 deferred shares of 1s. each. 610 preferred ordinary and 1,000 deferred shares taken up. £1 per share called up on the preferred ordinary, and 1s. on the deferred. £660 paid. Mortgages and charges: Nil.

Dick, Kerr & Co., Ltd. (63,407).—Return dated October 12th, filed October 17th, 1911. Capital £650,000, in £1 shares (350,000 preference). 305,000 preference and 260,000 ordinary shares taken up. £265,000 paid on 265,000 preference, £300,000 considered as paid on 260,000 ordinary and 40,000 preference. Mortgages and charges: £252,680.

Thos. W. Ward, Ltd. (81,020).—Return dated October 5th, filed October 23rd, 1911. Capital £350,000 in £1 shares (150,000 preference and 200,000 ordinary); 143,884 preference and 183,848 ordinary shares taken up; £147,732 paid on 143,884 preference and 3,848 ordinary; £180,000 considered as paid on 180,000 ordinary. Mortgages and charges: £93,852 13s. 2d.

Nalder Bros. & Thompson, Ltd. (62,214).—Return dated November 8th, filed November 15th, 1911. Capital £22,500 in £1 shares (10,000 preference); 8,256 preference and 11,125 ordinary shares taken up; £9,381 paid on 8,256 preference and 1,125 ordinary; £10,000 considered as paid on 10,000 ordinary. Mortgages and charges: Nil.

United Lighting and Maintenance Co., Ltd. (111,517).—Particulars of £500 debentures, created November 10th, 1911, filed pursuant to Sec. 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's property, present and future, including uncalled capital. No trustees.

Munster Electric Lighting Co., Ltd. (100,269).—Charges created by Receiver:—Four mortgages, dated October 23rd, 1911, to secure £250, £250, £250 and £50 respectively, charged on company's plant, machinery and electrical equipment and undertaking at Fethard and Callan, Ireland. Holders: J. Hunter, J.P., 20, Fairfield Crescent, Liverpool; R. H. Bindloss, 26, North John Street, Liverpool; J. W. Jones, 70, Victoria Street, Liverpool; and A. Henderson, 24, North John Street, Liverpool.

Foster Engineering Co., Ltd. (94,871).—Return dated July 10th, filed October 18th, 1911; capital, £45,000 in £1 shares: 41,350 shares taken up: £1 per share called up on 16,850 and 15s. per share on 11,500; £25,475 paid, £13,000 considered as paid on 13,000 shares. Mortgages and charges: £7,250.

Imperial Tramways Co., Ltd. (118,981).—Return dated March 9th, filed October 2nd, 1911, capital £400,000 in £10 shares (20,000 preference); all shares taken up; £10 per share called up on 10,000 ordinary; £100,000 paid; £300,000 considered as paid on 10,000 preference and 20,000 ordinary. Mortgages and charges: £330,000.

Cleveland and Durham Electric Power, Ltd. (89,539).—Return dated October 10th, filed October 16th, 1911. Capital £700,000 in £1 shares (350,000 preference); 333,703 preference and 157,600 ordinary shares taken up; £1 per share called up on 331,985 preference and 79,068 ordinary; £411,053 paid; £80,802 (except £6 5s. paid in cash) considered as paid on 1,770 preference and 78,592 ordinary. Mortgages and charges: £312,000.

Anglo-Argentine Tramways Co., Ltd. (25,363).—Acknowledgment of indebtedness dated October 26th, 1911, to secure £1,500,000 (supplemental to trust deed dated June 15th, 1910, securing £1,500,000 5 per cent. debenture stock), and ranking *pari passu* with said stock, power being reserved to the company to issue further debenture stock up to £6,000,000 (including the two said amounts of stock), charged on the company's undertaking and property, present and future, including uncalled capital, subject to prior charges. Trustees: Law Debenture Corporation, Ltd., 41, Threadneedle Street, E.C.

Beck Flame Lamp, Ltd. (in liquidation) (92,387).—Mortgage dated November 6th, 1911, to secure £500, charged on certain patents; leasehold messuage and premises at Hayes, Middlesex, and the company's undertaking and other assets, including uncalled capital. Holder: C. W. B. Bridson, Upmeads, Burcott Road, Purley.

English Electrical Co., Ltd. (112,639).—Issue on November 7th, 1911, of £1,000 debentures, part of a series of which particulars have already been filed.

Halifax and Bermudas Cable Co., Ltd. (28,972).—Return dated September 27th, 1911, filed same date. Capital, £50,000 in £5 shares. All shares taken up. £50,000 considered as paid. Mortgages and charges: Nil.

CITY NOTES.

Eastern Telegraph Co., Ltd.

Sir J. Wolfe Barry occupied the chair at the seventy-ninth ordinary general meeting of the company, held at Electra House, E.C., on November 15th. In moving the adoption of the report (see Electrical Review, p. 792), he said that the gross revenue for the half-year amounted to £672,300, against, for the corresponding half-year of 1910, £664,500, or an increase of £7,800. Messages and other receipts had not varied to any great extent, there being a small increase of about £500. The amount received for interest and dividends on investments, &c., showed an increase of £7,300. The total gross revenue for the half-year was the highest they had received for many years; in fact, it had only once been exceeded, and then very slightly. The total expenses for the half-year amounted to £291,300, against, for the half-year to June, 1910, £283,800, or an increase of £7,500. The principal item of increased expenditure was that relating to working expenses at stations, which was £13,800 more than for the corresponding half-year of 1910, and was chiefly due to an increase of £8,700 in salaries and wages, caused by automatic promotions and a slight augmentation in the number of staff, and to a readjustment of the method of payment for overtime and Sunday duty performed by the station staff at home and abroad, by which they materially benefited. Maintenance of instruments had also increased by £3,300, which was mainly due to the supply of new and improved apparatus which would still further increase the carrying capacity of their cables and give greater accuracy. Other items included in this abstract showed minor increases, while others showed reductions, the total increase under the abstract being £13,800. Against this increase there was a reduction of £5,000 in the expenses of negotiations, there having been some special expenses on this account in the half-year to June, 1910, while the expenses attending maintenance of cables were also less this half-year by £1,700. The net result of the half-year's working was practically the same as that for the half-year to June, 1910, there being a difference of only £289 in the net profit when comparing the two half-years, and the result shown might, he thought, be considered satisfactory. When he last addressed them he mentioned that the time was approaching for strengthening their cable system in the Mediterranean and elsewhere, and in furtherance of this object, the board had decided to lay an additional cable between Gibraltar and Egypt, touching at Malta. The cost of this additional cable, about £400,000, would be charged against the general reserve fund, as had been done under similar circumstances in the past. There was a sum of £24,492 charged in respect of a bonus paid to the staff. The directors of the Associated Companies, acting together, decided to celebrate the Coronation of his Majesty King George V by granting a bonus of one month's pay to every permanent employé of the staff ashore and on board ship who had been in the service of the companies, and in receipt of either salary or wages, for at least one year prior to May 31st, 1911. Apart from the special occasion of the Coronation, the directors were much pleased to be able to confer this benefit on the staff, to mark their appreciation of the loyal services which the employés had always rendered to the Associated Companies. In dealing with all questions affecting the welfare of the staff, the directors had always given the fullest consideration to any reasonable representations which the staff might desire to place before them, and when they were satisfied that such appeals were justified by the circumstances of the case, the matter was dealt with in as liberal a spirit as was consistent with the proper interests of the stockholders. This policy had engendered that good feeling which he was glad to say had always existed between the staff and the directors. In granting the additional benefit of the bonus, they felt confident that their action in allowing the staff to share to some extent in the prosperity of the company would receive the hearty approval of the stockholders. After providing for this and for the usual interim dividends, they had been able to make a contribution of £150,000 to the general reserve fund, and to carry forward £49,000. The general and other reserve funds now amounted to £2,452,000, after setting aside £250,000 as a provision on account of investment fluctuations. They had not added any further sum this half-year to the amount already provided, the figure of £250,000 being considered ample having regard to the estimated

reduction in the market value of their reserve fund investments as at June 30th, 1911. When addressing the stockholders a year ago, he referred to a proposal submitted by the British Postmaster-General to the various cable companies interested for the introduction of a reduced rate for deferred telegrams in plain language, and he explained that the Associated Companies had agreed to the proposal in principle, leaving the necessary details to be worked out. Since then the proposal had taken definite shape, and had been considered by the various Governments concerned, and it was expected that the British Postmaster-General would soon be in a position to make an official announcement on the subject. The Eastern Extension and Great Northern Telegraph Companies undertook, about six months ago, to make an advance, at 5 per cent. interest, to the Imperial Chinese Telegraph Administration, to be devoted towards the improvement and development of the telegraph and telephone services in China. As this company was a party to the traffic agreements between the Imperial Chinese Telegraph Administration and the Eastern Extension and Great Northern Telegraph Companies, they had taken their proportionate share in the transaction, and the total amount of this company's share was £125,000. The repayment of this advance was secured by the moneys due by the three companies to the Imperial Chinese Telegraph Administration, and payable from time to time under the existing agreements, The Chinese Imperial Edict authorising the signing of the agreement was officially communicated to, and approved by, the Ministers of Great Britan, Russia and Denmark.

Sir J. Denison Pender seconded the motion.

Mr. C. D. Stacey, speaking as one who had been in the service of the company for 12 years abroad, asked whether means could not be devised which would give each member of the staff down to the humblest able seaman or doorkeeper, a more individual interest in the welfare of the company at all times. They were happily largely free from the general and remarkably spreading unrest which pervaded the ranks of wage-earners throughout the world—an unrest which, in the opinion of competent judges, could only be met by some system of co-partnership. Profit-sharing was good, but it could never have the far-reaching effect of even a modest system of gradual co-partnership in leading every member of the staff to be zealously solicitous of economical working, and of everything which related to the common interest. The amount which would be involved by establishing such a system in their company would not be large. If it were started on a 5 per cent. basis, increasing 1 per cent. per annum to 7 per cent., the initial charge according to the schedules in the report would be about £14,000, or less than one-fifth of 1 per cent. on the capital of the company. It was not for him to suggest methods, but he trusted that the board would entertain the idea and work out a scheme.

The Chairman said that if any development of the idea of co-partnership was seen to be applicable to the working of telegraph companies, he was sure the board would give it consideration; but, at the same time, he would like to point out that the Associated Companies had gone a very long way at present towards interesting the staff in the success of the company, and no better example could be furnished than what he had told them about giving the whole staff a bonus.

The report was then adopted.

Provincial Tramways Co., Ltd.

The meeting of this company was held on Friday last, at the offices, Moorgate Station Chambers, E.C., Mr. Andrew Beattie, J.P., in the chair.

The Chairman, in proposing the adoption of the report, said that the past year had been one of the best that the company had had in its 39 years' history. The best year was in 1907, but there were exceptional circumstances that year which did not recur in the 12 months they were now dealing with. The very fine summer to some extent helped their receipts. He believed that the company was one of the oldest, if not the oldest, tramway concerns in the country, and although it had had a chequered career, its history had always been one of progress. When he joined the board, about 20 years ago, the net profits were a little over £16,000; during the past year they were £36,458. At that time they held tramways in Portsmouth, Cardiff, Plymouth and Grimsby. They sold the two former tramways in 1901 and 1902 respectively, and their annual income was brought down to about £18,000. However, they used the money which they received for the purchase of those lines in the electrification of their other tramways, and they had now got back to the highest earning powers that the company had ever had. They had debentures on which they paid 5 per cent., 6 per cent. preference shares, and this year they were able to pay 7½ per cent. on the ordinary shares. Those results had only been obtained by good management and economy; and they were all the more creditable when they took into account the very great increase in local rates. In one town they were paying 100 per cent. more in rates than they were some years ago, and that was symptomatic of what was going on all over the country. The assessment of tramway undertakings by local authorities had almost reached the breaking point, and he hoped the authorities throughout the country would bear that in mind, and not kill the goose that laid the golden eggs. During the past year they had obtained an extension of their tramways at Cleethorpes from 1920 to 1930, and as years went on they expected to reap considerable advantage from that extension. They had made an application to the Light Railway Commissioners for an order to extend their lines from Gosport to Lee, on the Solent, and he hoped that when they met next year he would be able to tell them that their application had been granted. They had been paying £1,000 a year for many years to insure against third-party risks, and the board had been looking into the question to see whether it would not be wise for them to set aside a sum each year for that purpose and become their own insurers. For the past three years the cost to the insurance company had only been about £300 a year, while they had paid £1,000 a year, and it was, therefore, worth considering whether it would not pay them better to act as their own insurers.

Mr. S. Hern, in seconding the motion, said that last year, taking advantage of the increase in revenue, the board had set aside £10,000 to reserve and depreciation.

The report was adopted.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

County of London Electric Supply Co., Ltd.—Further issue of £50,000 4½ per cent. second debenture stock.

The Committee has ordered the undermentioned securities to be quoted in the Official List:—

Cascade Water, Power and Light Co., Ltd.—$285,500 first mortgage 4½ per cent. 30-year sinking fund gold coupon bonds of $500 each, Nos. 22 to 507 and 516 to 600.

Chiswick Electricity Supply Corporation, Ltd.—£80,000 4½ per cent. first mortgage debenture stock.

Montreal Water and Power Co.—Further issue of £20,000 4½ per cent. first mortgage prior lien gold bonds of £100 each, Nos. 8,011 to 8,110 and 8,198 to 8,297.

Notting Hill Electric Lighting Co., Ltd.—11,402 6 per cent. non-cumulative preference shares of £10 each fully paid, Nos. 2,999 to 14,400, in lieu partly of the 10,852 ordinary shares now quoted.

Bullers, Ltd.—The directors' report for the year ended July 31st last, as printed in the *Financial News*, states that the volume of trade mentioned in the previous report has been maintained, but competition is still very keen. The order books are now very full and prospects are brighter. Large extensions have been completed at the Hanley works, and probably further extensions will have to be made. The accounts show a profit of £9.629, plus £453 brought forward, making £10,083. The interest on the preference shares, £7,500, has been paid, leaving a balance of £2,583. The directors propose to place £2,000 of this to reserve account, making it £48,000, and to carry forward £583.

Rio de Janeiro Tramway, Light and Power Co., Ltd.—A special general meeting of shareholders will be held at Toronto on December 8th, for the purpose of considering and confirming a by-law passed by the directors, to increase the capital stock from $40,000,000 to $50,000,000 by the issue of 100,000 additional shares of $100 each. It is announced that the development and growth of the company's business calls for this increase. Amongst other things the company has purchased the Jacarepagua tramway lines, which are being equipped by the company for electrical operation. It has also acquired the Interurban Telephone Co., which at present is operating in the city of Nictheroy, the capital of the State of Rio de Janeiro, and has direct communication with the company's telephone system in Rio de Janeiro by means of a submarine cable across the Bay. In Rio das Lages power station work is under way for the installation of two additional generators of 16,000 H.P. each, but this will not suffice to meet power requirements within a few years. Important other works have been begun.

British Columbia Electric Railway Co., Ltd.—The directors' annual report was issued yesterday. It shows an increase of 43 per cent. in gross receipts and 34 per cent. in net earnings. Since June the gross earnings have been increasing 45 per cent. and the net earnings 17 per cent. The dividend on the deferred ordinary stock is 8 per cent. for the year.

British Electric Traction Co., Ltd.—On Wednesday an extraordinary general meeting was held, at which the alterations in the Articles and the amended scheme of the directors were confirmed.

Manaos Tramways and Lighting Co., Ltd.—The directors' report for the year ended April 30th, as quoted in the *Times*, says that active construction work by the contractors was completed in June, 1910, but the reconstruction of the lighting system and other improvements carried out by the company's own staff continued for some months after that time, so that the construction works somewhat interfered with satisfactory operation, and delayed final organisation for nearly the whole of the fiscal year. All works originally contemplated are now completed, and better results are being shown. The result of the company's operation for the year was a profit of £30.431, as compared with £18,978 for the preceding year. After providing for London expenses, &c., and debenture interest, there remains £12,446, with £1,583 brought forward, making £14,029. The directors recommend that £10,520 be transferred to accident, contingencies and general reserve, and that £3,509 be carried forward.

United Wire Works, Ltd.—The directors' report for the year ended September 30th, after setting aside £1,500 for depreciation, shows £7,079 available, out of which a dividend of 3 per cent. on the ordinary shares is recommended, carrying forward £621.

R. Hornsby & Sons, Ltd.—After paying the preference dividend (6 per cent. per annum) the directors recommend a dividend on the ordinary and new shares, at the rate of 6½ per cent. per annum for the year ended September 30th, placing £25,000 to reserve, and carrying forward £3,851.

West India and Panama Telegraph Co., Ltd.

Mr. W. B. Kingsford (chairman) presided at Winchester House, E.C., on Wednesday, November 15th, over the meeting of this company, and in moving the adoption of the report (see Electrical Review, page 792), he said that they had had, as he predicted at their last meeting, a satisfactory half year. On the expenditure side there was an increase of £694. Some of this increased expenditure represented the cost of renewing instruments and maintaining landlines, which two items in the nature of things were always somewhat fluctuating. One item of increased expenditure was incurred by the visit which they instructed Mr. Morell, their general superintendent in the West Indies, to make to their stations. Leaving out Demerara, where he had been a little while before, Mr. Morell made a pretty complete tour of inspection, which occupied a considerable time, and his interviews with Government officials, with many of their leading customers, and last, but not least, with the different members of their staff, coupled with much useful information and various good suggestions with which he furnished them, had proved of great benefit to the company. The total of the items which went to make up the cost of repairs to their cables, was £832 less than for the corresponding year. The traffic receipts were £3,729 in excess of those for the corresponding period. The total figures showed that, including interest on investments and the amount brought forward, they had an available balance of £24,719, which the directors recommended should be dealt with as proposed in the report. Having regard to the great importance to them of maintaining their cables, which were 22 in number, in a state of thorough efficiency, they had wished for a long while to increase their reserve fund, but unfortunately they could not do that whilst the preference dividend continued in arrears. A year ago, when these arrears were cleared off, and they were also able for the first time for 10 years to pay a dividend to the ordinary shareholders, they at once placed £1,000 to reserve. That day, as they had a larger sum at their disposal, they thought it a right and prudent policy to strengthen the reserve fund with something more substantial. After placing £3,500 to the reserve fund, they would carry forward £2,825. They would have noted that the price of sugar of late had considerably increased, and this naturally was having a beneficial effect upon the sugar-growing colonies. This fact, together with the continued good progress made by the oil industry of Trinidad, was duly reflected in their traffic receipts. It was a matter of common knowledge that of late years most securities had been falling in value almost continually, and notably so in some instances in those very securities which had always been counted most stable. As a matter of course, the heavy fall in values had affected them like other people, but he was sure it would give them great satisfaction to know that the total depreciation on their investments in the reserve fund amounted to no more than £3,400, or, to be very precise, £4 3s. 8d. per cent. of their original cost. The traffic receipts for the current half-year down to the end of October, which was their latest return, compared favourably with those for the corresponding period a year ago.

Mr. H. Holmes seconded the motion.

Mr. J. Melvin supported the board in the policy of strengthening the reserve, for in such a company as theirs the first thing to do was to make the house strong. He suggested that as the price of copper was normal at the present time, the directors might make provision for what they would require in the coming year. With regard to the company's investments, he agreed that the list was a splendid one, but seeing that the company had debentures of £80,000, he suggested that it might be well to reduce these, even by selling some of the investments.

The Chairman said they only used copper in their cables, and as a matter of fact, they had ordered some fresh cable. The debentures matured in 1916, and the board considered, taking everything into account, that it was not desirable to take steps at present to pay them off.

The motion was then carried, and a vote of thanks was accorded to the board and staff.

Western Telegraph Co., Ltd.

The meeting of this company was held at Electra House, Finsbury Pavement, E.C., on Wednesday, November 15th. Sir Wolfe-Barry, who presided, said that the message revenue for the half-year ended June 30th last showed an increase of nearly £10,000 over that of the corresponding period of 1910. In making comparisons of the message receipts it must be borne in mind that the tariff with the River Plate and West Coast of America was reduced on June 1st, 1910, by 75 centimes per word, and on March 30th last by a similar amount for telegrams from Brazil. It was also to be remembered that the German cable from the Canaries to Pernambuco had been in operation since March 29th last. The improvement, in spite of the above circumstances, was not due to any exceptional circumstances, but apparently was in consequence of the steady increase in trade and commerce in South America. With regard to the current half-year to date there was a small decrease in revenue, due almost entirely to a slightly lower exchange value of the Brazilian milreis. During the half-year under review there were increased amounts derived from interest on deposits, rents and transfer fees to the extent of £830, but interest on investments was lower by about £8,000, leaving a net increase in revenue from all sources of about £2,500. The reduction in the interest on investments was consequent, as he stated at the last meeting, upon the sale of reserve fund investments during the year 1910 to meet payments for new cables, &c. Although at present their message revenue was being maintained at a satisfactory figure, in spite of the recent large reductions in tariff, it was accompanied by increased working expenses consequent upon the extra traffic carried and the enhanced cost of living in the countries where their stations were situated. These in London were more by £255, at the stations abroad by £10,714, principally under the item of salaries and wages in respect of the new station at Buenos Ayres, an increased number in the staff at other places, and overtime. Maintenance of cables accounted for an increased net expenditure of £7,056, making a total increase of expenses of £18,025. With respect to the increase, he would point out that the cable steamer *Norseman* was in commission for the whole six months, against four in 1910. The *Cormorant* cost more for repairs and docking. Some of their cables between Lisbon and Madeira and St. Vincent were interrupted on five occasions, necessitating the charter of other cable steamers. More cable was used in repairs, and there was a larger depreciation and insurance of cable in stock. Against these increased expenses they were relieved of the cost of the *Cambria*, chartered last year to relieve the *Norseman*. The increases under Abstracts A, B and C, amounted to £18,025, reduced by a smaller expenditure on sundry other items, amounting to £1,609, leaving on balance a net excess of expenses of £16,416. After providing £16,373 for debenture stock interest, and £7,930 for income-tax, there remained a balance of £215,898, plus £30,276 brought forward from December last, making a total of £246,175, out of which sum a bonus had been paid to the staff to commemorate the Coronation of King George V, amounting to £8,613. A quarterly interim dividend, amounting to £31,189, had been paid, £140,000 transferred to the general reserve fund, and £10,000 to the land and buildings depreciation fund. The directors now recommended the declaration of a final dividend of 3s. per share, making, with the interim dividends, a total dividend of 6 per cent. for the year, also the payment of a bonus of 2s. per year, both free of income-tax, which together would amount to £51,982, leaving a balance of £4,390 to be carried forward. The shareholders would perhaps have learned from newspaper reports published recently that a decision had been given in the Brazilian Federal Court in the suit brought by the company for the annulment of the Government decree authorising the laying of submarine cables along the coast of Brazil, which they considered would, if carried out, infringe the rights and privileges which they granted to the company. The judge dismissed the case, considering that the decree was at present a mere authorisation, and on the ground that it contained the express reservation of the rights of third parties, who, in the words of the judgment, "cannot be and are none other than the Western Telegraph Co." The judge also stated that it was open to the company to take further proceedings in the defence of the rights secured by its contract in the event of these being ignored or violated by the carrying out of the decree.

Sir J. Denison Pender seconded the motion.

Replying to Mr. Fuller as to the note in the balance sheet relating to the company having guaranteed certain stock of the West Coast of America Telegraph Co. and the Pacific and European Telegraph Co., the Chairman said they were not likely to be called on to pay any guarantee.

The motion was carried.

Prospectus.—*The Constantinople Telephone Co.*—The subscription list was to close yesterday in an issue of 60,000 ordinary shares of £5 each (£300,000). The objects of the company are already well known to our readers. The concession was granted by the Imperial Ottoman Government for the construction and operation of a general telephone system in Constantinople and its suburbs, as the result of prolonged negotiations conducted by Mr. Herbert Laws Webb. The period of the concession is 30 years, and if the system is not by then bought over by the Government, the period is to be extended by 10 years. The tariff is to be exclusively measured rate, with the exception that there is to be a flat rate for private residences. The Government is to receive a royalty of 15 per cent. on the gross telephone revenue. A plant of 10,000 lines will be installed, capable of extension to a much larger figure. £27,500 is payable to the Telephone Development Co., Ltd., for the expenses of preliminary negotiations and for obtaining the concession. The articles give power to pay 5 per cent. interest on the paid-up capital during the period of construction. The directors of the company are: Stanley J. Goddard, general superintendent of the National Telephone Co., Ltd.; Leon Pissard, Constantinople; D. Sinclair, general manager, B.I. and Helsby Cables, Ltd.; D. Smith, United River Plate Telephone Co., Ltd.; E. Thurnauer, French Thomson-Houston Co., Paris; H. Laws Webb; and F. R. Welles, vice-president of the Western Electric Co., Paris. The consulting engineers are Messrs. Frank Gill and W. W. Cook, engineer-in-chief and assistant engineer-in-chief respectively of the National Telephone Co., Ltd. The head office is Adalet Han, Galata, Constantinople.

Buenos Ayres Lacroze Tramways Co., Ltd.—The directors' report for the year ended June 30th states that the gross receipts were $4.681,319 and operating expenses $2,842,952, leaving net receipts of $1,838,367. After deducting from the net earnings the amounts paid for amortisation and interest on debentures, there remains a net balance of $1,482,944, which (says a financial contemporary) the directors propose to distribute as follows: Five per cent. to the reserve fund, $73,989: 5 per cent. to the directors, $73,989; ½ per cent. to the syndic, $7,398; to fund providing for accidents, $13,000; to special fund for renovations, $306,567; to the shareholders, $911,100; to next year, $96,898. Thus the shareholders will receive $911,100, gainst $750,000 distributed last year.

MARKET QUOTATIONS.

Wednesday, November 22nd.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric .. .. per cwt.	5/-	..
a „ Nitric .. .. „	22/-	..
a „ Oxalic .. .. „	28/-	..
a „ Sulphuric .. .. .. „	5/6	..
a Ammoniac Sal .. .. .. „	42/-	..
a Ammonia, Muriate (crystal) .. per ton	£29	..
a „ „ .. .. .. „	£30	..
a Bleaching powder .. .. .. „	£5 10	..
a Bisulphide of Carbon .. .. „	£18	..
a Borax .. .. „	£16	..
a Ferro-Silicon (50 %) .. .. „	£11 10	..
a Copper Sulphate .. .. .. „	£20	..
a Lead, Nitrate .. .. .. „	£25 10	£1 10 inc.
a „ White Sugar .. .. „	£22 15	..
a „ Peroxide .. .. .. „	£32	..
a Methylated Spirit .. .. per gal.	2/6	..
a Potassium, Bichromate, in casks per lb.	3½d.	..
a Potash, Caustic (75/80 %) .. per ton	£20	..
a „ Chlorate .. .. .. per lb.	3½d.	..
a „ Perchlorate .. .. „	4½d.	..
a Potassium, Cyanide .. .. „	7d.	..
a Shellac .. .. .. per cwt.	68/-	..
a Sulphate of Magnesia .. .. per ton	£4 10	..
a Sulphur, Sublimed Flowers .. „	£6 10	..
a „ Recovered .. .. „	£5 10	..
a „ Lump .. .. .. „	£5 5	..
a Soda, Caustic (white 70 %) .. „	£11	..
a „ Chlorate .. .. .. per lb.	3½d.	..
a „ Crystals .. .. .. per ton	£3 5	..
a Sodium Bichromate, casks .. per lb.	3d.	..
a „ Cyanide (basis 100 %) .. „	7d.	..
METALS, &c.		
b Aluminium Ingots, in ton lots .. per ton	£70	..
b „ Wire, in ton lots .. „	£102	..
b „ Sheet, in ton lots .. „	£120	..
p Babbitt's metal ingots .. .. „	£38 to £145	..
c Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	¼d. inc.
c „ Tube (brazed) .. .. „	9⅜d.	¼d. inc.
c „ „ (solid drawn) .. „	7⅛d.	¼d. inc.
c „ Wire, basis .. .. .. „	7⅞d.	¼d. inc.
c Copper Tubes (brazed) .. .. „	9⅜d.	¼d. inc.
c „ „ (solid drawn) .. „	9½d.	¼d. inc.
g „ Bars (best selected) .. per ton	£73	£1 inc.
g „ Sheet .. .. .. „	£73	£1 inc.
g „ Rod .. .. „	£73	£1 inc.
c „ (Electrolytic) Bars .. „	£60 10	£2 inc.
c „ „ Sheets .. „	£76	£1 10 inc.
c „ „ Rods .. „	£64	£2 inc.
c „ „ H.C. Wire per lb.	8d.	¼d. inc.
f Ebonite Rod .. .. .. „	5/3	..
f „ Sheet .. .. .. „	4/9	..
a German Silver Wire .. .. „	1/11	..
h Gutta-percha, fine .. .. „	5/- to 7/-	..
h India-rubber, Para fine .. .. „	4/3	1/1 dec.
j Iron Pig (Cleveland warrants) .. per ton	47/10½	1/4 inc.
j „ Wire, galv. No. 8, P.O. qual. „	£14	..
g Lead, English Pig .. .. .. „	£16 5 to £16 7 6	..
m Manganin Wire No. 28 .. .. per lb.	6/6	..
g Mercury .. .. per bot.	£8 10	..
d Mica (in original cases) small .. per lb.	6d. to 2s.	..
d „ „ „ medium „	2/6 to 4/-	..
d „ „ „ large .. „	4/6 to 8/6	..
p Phosphor Bronze, plain castings „	11d.	..
p „ „ rolled bars & rods „	1/0½.	..
p „ „ rolled strip & sheet „	1/1	..
o Platinum .. .. per oz.	185/-	..
e Silicium Bronze Wire .. .. per lb.	8¾d.	¼d. inc.
r Steel Magnet, in bars .. .. per ton	£55	..
g Tin, Block (English) .. .. „	£195 to £197	£2 inc.
n „ Wire, Nos. 1 to 16 .. .. per lb.	2/3	1d. inc.
p White Anti-friction Metals .. per ton	£45 to £150	..
k Zinc, Sh't (Vieille Montagne bnd.) „	£30 12 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

STOCKS AND SHARES.

Tuesday Evening.

THE tone throughout the Stock Exchange has become rather more nervous, for which the hint that money rates may stiffen before Christmas is in the main responsible. Moreover, the various meetings of railwaymen on Sunday last were not of a nature to help the railway market, by whose fluctuations a number of other departments are indirectly affected.

After many days—not to say years—the North London Railway is about to be electrified, the North-Western Railway making the announcement at the end of last week. Thus there will be confirmed the anticipations so long current, and a most important link added to the network of electric lines running out to the suburbs. Included in the comprehensive scheme is an extension of the Bakerloo portion of the London Electric Railways. The prophetic eye may well see in these arrangements a possible gigantic combination of suburban transport companies, but this, of course, lies wholly in the future, and its accomplishment could only take place in the teeth of violent opposition from various interested sources.

Metropolitans rose ¼, but Districts fell ¼, the former rise being associated with the idea that the Metropolitan line has still plenty of scope for increasing its traffics. District 4½ per cent. Preference rose 2 points, and the 3½ per cent. Guaranteed put on 1. The former stock received its full dividend for the last half-year, and will, no doubt, do so in respect of the coming six months; if maintained, this means a yield of 5 per cent. on the money, and, in view of the energetic management of the District Company, it is considered in the market that the 4½ per cent. First Preference may already be regarded as likely to get its full dividend in the future. The present price carries the dividend due next February. Electric Railway stocks are steady but quiet. Underground Electric 6 per cent. bonds are rather easier.

There has been no fresh development in British Electric Traction issues, the prices of which remain dull. London United Tramways Preference again lost ¼, and Metropolitan Electric Preference fell $\frac{1}{32}$. On the other hand, Potteries Ordinary are a shade higher. The market for English Electricity Supply shares is firmer than it has been for a long while past, and fresh buyers are coming forward daily. The dealers who for some time have found it profitable enough to go short of shares are a little surprised at the turn which events have taken, and they are not eager to sell except at higher prices. The features this week are the rises of 5s. in Brompton Ordinary and 7s. 6d. in Westminsters—the last-named shares being in scant supply. Several other improvements, however, have taken place, City Ordinary and Preference putting on ¼ and ¼ respectively, while Charing Cross rose ¼ and Brompton Preference gained a similar fraction. Amongst the provincial shares, Bournemouth and Poole Second Preference came into demand on the good yield obtainable on the shares, and at 10¾, the enhanced price, there are very few shares about. In the Prior-Charge stocks there is no particular change, but St. James' Debenture, at 87, is a point higher on the week.

In the Foreign List, business is decidedly active amongst most of the Traction, Light and Power descriptions. Northern Light and Power bonds have recovered 6 after their steep fall, very little inquiry being sufficient to put the price up thus substantially. Rio Trams continue to crumble, the price again falling 1½ on account of the new issue of shares, of which we were able to give a hint last week. The company's bonds, however, are steady, the Firsts, at 102½, being ¼ better. In the Mexican group fluctuations are mostly on the dull side, but this does not argue absence of business, for, as a matter of fact, the jobbers in this section find their hands full of orders every day. Shawinigan Capital stock fell 2 and Sao Paulo Trams lost their two-point rise of last week. Winnipeg Debenture came to market on account of the high price at which this 4½ per cent. bond stands as compared with other securities of similar character, and the quotation is 2 down. Calcutta Preference recovered half their previous drop, and now stand at 5½. Melbourne 5 per cent. First Debenture at 98 is slightly higher, and River Plate 5 per cent. Debenture hardened to 103. The premium on the new Anglo-Argentine Tramways First Preference keeps very steady at 1¼ for cash. The new Mexican Light and Power Second Debenture is quoted at 1 discount to par, *i.e.*, the issue price. The company's Common shares have drooped, while Monterey bonds have gained a trifle.

Telegraph stocks and shares are quietly steady, with the exception of Amazons, which show a fall of 10s. A seller of a few shares came along, and found the market rather a tender one. Anglo-American issues are again unchanged. Eastern Ordinary rose a point, bringing the higher price to a level at which the yield is exactly 5 per cent. on the money. Westerns are ¼ higher, and the good tendency of the market in general is reflected in a 5s. rise which has taken Globe Ordinary to 11. Other Trust issues are practically unaltered, a fall of 1 in Mackay Common being balanced by a rise of equal amount in the Preferred.

National Telephone Deferred stock has been pretty extensively sold on its big rise of 7 points last week, with the consequence that half of it has been lost. Some announcement as to what proprietors may expect in the way of distribution, may possibly be made next month. Following the relapse in the Deferred, the company's Third Preference shares lost $\frac{1}{16}$. New York Telephone bonds are harder. No premium was quoted on the new Constantinople Telephone shares in advance of the allotment, the market not having been started in them. Some people think that the issue appeared at a somewhat unfortunate time, in view of the war between Turkey and Italy, which, although it has, of course, no direct influence upon a telephone company in Constantinople, yet exercises a sentimental effect upon the mind of the investor. The company has a strong Board, and seems to offer good prospects.

In the Manufacturing group, Telegraph Constructions, after their steady rise, have this week fallen 30s., but other manufacturing shares are good. Crompton Debentures at 63½ are 3¼ points harder. Callender's Preference shares rose $\frac{1}{16}$, and Aron Ordinary are better to the same extent. Edison & Swan partly-paid shares have followed up their jump of last week with a further gain of $\frac{1}{16}$. Electric Construction Preference, on the other hand, at 1¼ are ¼ down. The excellent results achieved by the Castner-Kellner Company, upon which we have already commented, caused a further rise, and the shares now stand at 3¾. A slight fall in Babcock Ordinary restores the quotation to what it was a fortnight ago.

The subscription-lists of the South American Light and Power Debentures closed within two or three hours of their opening last week, and a keen demand sprang up for the scrip at 2 premium before the allotment letters came out.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations Nov. 21st.	Rise + or Fall —	Present Yield p.c.
	*	1910.	1911.			£ s. d.
Bournemouth & Poole, Ord.	10	5½	5†	7⅜ — 8⅜	..	6 5 9
Do. 4½ % Pref.	10	4½	4½	8⅜ — 9⅜	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10⅜ — 11	+ ⅛	5 9 1
Do. 4½ % Deb. Stock	Stock	4½	4½	101 —108	..	4 7 5
Brompton & Kensington, Ord.	5	10	9†	7⅜ — 8⅜	+ ⅛	5 19 4
Do. 7 % Cum. Pref.	5	7	7	7⅜ — 8	+ ⅛	4 7 6
Central Electric Supply, 4 % Guar. Deb.	100	4	4	99 —102	..	3 18 5
Charing Cross, West End & City	5	5	5†	3⅞ — 4	+ ⅛	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅝	..	4 12 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅛	..	5 5 11
Do. Do. 4 % Deb.	100	4	4	94 — 98	..	4 1 8
Chelsea, Ord.	5	5	4†	3⅝ — 4⅜	..	5 14 3
Do. 4½ % Deb.	Stock	4½	4½	98 —100	..	4 10 0
City of London, Ord.	10	7	6†	12⅜ — 12⅝	+ ⅛	5 8 9
Do. 6 % Cum. Pref.	10	6	6	12 — 13	+ ½	4 12 4
Do. 5 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb.	100	4½	4½	101 —104	..	4 6 7
County of Durham, 5 % First Mort. Deb.	Stock	5	5	89½ — 91½	..	5 9 3
County of London, Ord.	10	5	4†	3⅝ — 3⅞	..	4 18 8
Do. 6 % Pref.	10	6	6	11 — 11½	..	5 4 4
Do. 4½ % Deb.	Stock	4½	4½	108 —110	..	4 1 10
Do. 4½ % Second Deb.	Stock	4½	4½	99 —102	..	4 8 3
Edmundson's, Ord.	5	Nil	Nil	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	2 — 2½	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	82 — 85	..	5 5 11
Folkestone	5	6	6†	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	95 — 98	..	4 11 10
Hove	5	9	8†	6½ — 7½	..	6 4 2
Kensington & Knightsbridge, Ord	5	9	8†	6⅞ — 7⅛	..	6 4 2
Do. 4 % Deb.	100	4	4	91 — 93	..	4 8 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	8	2	..	1½ — 2	— 1/16	3 0 0
Do. 6 % Pref.	5	6	6	4⅜ — 4⅞	..	6 3 1
Do. 4 % First Mort. Deb.	Stock	4	4	89 — 92	..	4 7 0
Metropolitan	5	5	4†	3½ — 4	..	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 14 9
Do. 4½ % First Mort. Deb.	Stock	4½	4½	101 —106	+1	4 4 11
Do. 3½ % Mort. Deb.	Stock	3½	3½	84½ — 87½	..	4 0 0
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96½ — 98½	..	4 11 5
Newcastle-on-Tyne	5	4	4†	3½ — 4	..	5 0 0
Do. 5 % Pref., Non. Cum.	5	5	5	4 — 4½	..	5 11 1
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	..	4 18 0
Notting Hill	10	8	6†	..	..	..
Oxford	5	7½	6†	6⅛ — 6⅝	..	5 9 5
St. James' and Pall Mall, Ord.	5	10	10†	8 — 8½	..	5 17 8
Do. 7 % Pref.	5	7	7	6⅞ — 7¼	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	86 — 88	+1	3 19 7
Smithfield Markets, Ord.	5	Nil	..	1⅜ — 1⅝	..	Nil
South London, Ord.	4	5	..	2⅜ — 3⅛	..	6 8 1
Do. 5 % First Mort. Deb.	100	5	5	99 —102	..	4 18 0
South Metropolitan, 7 % Pref.	1	7	7	1 — 1⅛	— 1/16	6 8 11
Do. 4½ % First Deb. Stock	100	4½	4½	95 — 98	..	4 11 10
Urban, Ord.	5	5	..	½ — ⅝	..	..
Do. 5 % Cum. Pref.	5	5	..	2 — 2½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	86½ — 88½	..	5 1 8
Westminster, Ord.	5	10	10†	7⅞ — 8⅜	+ ⅛	5 19 5
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 5⅛	..	4 8 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅜	..	5 6 8
Calcutta, Ord.	5	8½	7†	6½ — 7 xd	..	6 1 5
Do. 5 % Pref.	5	5	5	5 — 5½	+ ⅛	4 15 3
Calgary Power, 1st Mort. Bds.	100	5	5	96½ — 98½	..	5 1 6
Canadian Gen. El. Com.	$100	7	7†	115 —120	..	5 16 8
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	..	1 3/16 — 1 5/16	..	3 4 0
Do. 5 % Deb.	100	5	..	93 — 96	..	5 4 2
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	94 — 96	..	6 5 0
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	84½ — 87½	..	5 14 3
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	91½ — 93½	..	5 9 3
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/32 — 3/32	+ 3/32	Nil
Do. 6 % Pref.	1	6	6	7/8 — 1	..	8 0 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	102 —104	..	4 16 2
Madras, Ord.	5	..	..	2⅜ — 3⅛	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	97 — 99	+ ½	5 1 0
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	88 — 90	..	5 11 1
Mexican Lt. & Power, Common	$100	4	4†	90 — 92	—1	4 7 0
Do. 7 % Cum. Pref.	$100	7	7	108 —110	..	6 7 3
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95½ — 97½	..	5 2 7
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	91 — 93	+1	5 7 6
Montreal, Lt., H. and Power	$100	7	8	185 —190	..	3 13 8
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	..	40 — 42	+6	11 18 2
River Plate, Ord.	Stock	10	..	223 —233	..	4 5 10
Do. 6 % Non-Cum. Pref.	Do.	6	6	106 —112	..	5 7 2
Do. 5 % Deb. Stock	Do.	5	5	102 —104	+ ½	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital	$100	4	5†	122 —124	—2	3 3 6
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	103 —105 xd	+ ½	4 5 9
Toronto Power, 4½ % Deb.	Do.	4½	4½	100 —102	..	4 8 3
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92 — 94	..	5 6 5
Victoria Falls Power, Pref.	1	Nil	11¼d.	1/8 — 1/4	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106½—108½	..	5 10 7

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	..	7/8 — 1	— ⅛	..
Do. 5 % Deb. Red.	Stock	5	5	99 —101	..	4 19 0
American Telep. & Teleg., Cap.	$100	8	8†	143 —145	..	5 10 4
Do. Collat. Trust	$1000	4	4	94½ — 96½	..	4 2 11
Anglo-American Telegraph	Stock	3½	3†	67 — 69	..	5 8 8
Do. 6 % Pref.	Do.	6	6	110½—111½	..	5 7 7
Do. Def.	Do.	30/-	..	25⅞ — 26⅜	..	5 13 8
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	..	4 17 1
Chili Telephone	5	7	..	6⅞ — 7⅛	..	4 18 8
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	87 — 89	..	4 9 11
Cuba Telegraph	10	6	6†	10 — 10⅜	..	5 11 7
Do. 10 % Pref.	10	10	10	17 — 18	..	5 11 1
Direct Spanish Telegraph, Ord.	5	4	4†	3½ — 3⅝	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	8½ — 8⅝	— ⅛	5 14 3
Do. 4½ % Debs.	50	4½	4½	100 —102	..	4 8 3
Direct United States Cable	10	4½	..	7⅞ — 8⅛	..	5 9 1
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99½—101½	..	4 8 8
Eastern Telegraph, Ord. Stock	Stock	7	5†	137 —140	+1	5 0 0
Do. 3½ % Pref. Stock	Do.	3½	3½	83½ — 85½	..	4 1 10
Do. 4 % Mort. Deb.	Do.	4	4	100½—102½	..	3 18 1
Eastern Extension	10	7	5†	13½ — 13⅝	..	5 1 10
Do. 4 % Deb.	Stock	4	4	100½—102½	..	3 18 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98½—100½	..	3 19 7
Globe Telegraph and Trust	10	5⅞	6	10⅞ — 11⅛	+ ⅛	5 6 8
Do. 6 % Pref.	10	6	6	12⅞ — 13⅜	..	4 9 9
Great Northern Telegraph	10	18	5†	34½ — 35¼	..	5 8 3
Indo-European Telegraph	25	18	5†	56 — 58	..	5 12 1
Mackay Companies Common	$100	5	5†	86 — 89	—1	5 12 4
Do. 4 % Cum. Pref.	$100	4	4	74 — 77	+1	5 8 11
Marconi's Wireless Telegraph	1	5	..	2⅜ — 2½	..	..
Do. 7 % Cum. Partic. Pref.	1	16	..	1⅝ — 2⅛	..	..
Monte Video Telephone, Ord.	1	6	6	1⅛ — 1¼	..	5 12 11
Do. 5 % Pref.	1	5	5	1⅛ — 1¼	..	5 6 8
National Telephone, Pref.	Stock	6	6†	103½—105½	..	5 13 9
Do. Def.	Do.	6	6†	121½—123½	—3½	4 17 2
Do. 6 % Cum. 1st Pref.	10	6	6	9½ — 10½	..	5 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9½ — 10½	..	5 17 1
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5½ — 5¾	— 1/16	4 10 11
Do. 3½ % Deb.	Stock	3½	3½	99 —101	..	3 9 4
Do. 4 % Deb.	Do	4	4	99 —101	..	3 19 3
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	100½—101½	+ ½	4 8 8
Oriental Telep. and Elec.	1	8	..	1⅜ — 1⅝	..	4 18 6
Do. 6 % Cum. Pref.	1	6	6	1⅜ — 1⅝	+ 1/16	4 18 8
Do. 4 % Red. Deb.	Stock	4	4	88½ — 90½	..	4 8 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	100 —102	+ ½	3 18 5
Reuter's	8	5	5†	8⅞ — 9⅛	..	4 5 3
Submarine Cables Trust	Cert.	6	6	130 —133	..	4 10 3
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99 —101	..	4 9 1
United River Plate Telephone	5	8	8	7⅛ — 7⅝	..	5 6 8
Do. 5 % Cum. Pref.	5	5	5	5¼ — 5½	..	4 10 11
West Coast of America	2½	2½	2½	1⅞ — 1⅞	..	4 15 3
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	98½—100½	..	3 19 7
West India and Panama Teleg.	10	1½	..	2⅜ — 3	..	3 3 4
Do. 6 % Cum. 1st Pref.	10	6	6	10½ — 10¾	..	5 11 7
Do. 6 % Cum. 2nd Pref.	10	6	6	10 — 10½	..	5 14 3
Do. 5 % Debs.	100	5	5	102 —104	..	4 16 2
Western Telegraph, Ltd.	10	7	6†	13⅜ — 14½	+ ½	4 18 3
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 17 8
Western Union Tel., 4 % Bnds. A	$1000	4	4	105½—108½	..	3 13 9
Do. 4½ % Fdg. Bonds	$1000	4½	4½	99 —102	..	4 8 3

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911	Closing Quotations Nov. 21st.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅞ — 1	..	Nil
Do. 5 % Pref.	1	5	5	15/16 — 1	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11
Brit. Elec. Trac., Ord.	10	Nil	Nil	1 — 1⅛	..	Nil
Do. 6 % Pref.	10	1½	1½	3⅞ — 4⅛	..	3 8 7
Do. 5 % Deb.	100	5	5	98 — 96	..	5 4 2
Do. 4½ % 2nd Deb.	100	4½	4½	78 — 82	..	5 9 9
Central London Railway, Ord.	100	3	3†	67 — 69	..	4 5 9
Do. Pref.	100	4	4	84 — 86	..	4 13 0
Do. Def.	100	2	..	50 — 52	—1	3 18 5
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 11
City & South London, Ord.	100	1½	1¾†	30½ — 31½	..	4 14 3
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	103 —104	..	4 15 3
Do. Do. 1908	100	5	5	102 —104	..	4 16 2
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
Dublin United Trams, 6 % Pref.	10	6	6	11 — 12	..	5 0 0
Great Northern & City, Pr'f. Ord	10	Nil	..	1 — 1⅛	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	3†	⅜ — ½	..	Nil
Do. 4½ % Deb.	100	4½	4½	73 — 78	—1	5 14 8
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2⅜ — 3	..	4 8 4
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	79 — 82	..	6 1 11
London Elec. Railw'ys, 4 % Deb.	100	4	4	96 — 98	..	4 1 8
London United Trams, 5 % Pref.	10	Nil	..	2⅛ — 3⅜	— ⅛	Nil
Do. 4 % Deb.	100	4	4	71 — 75	..	5 6 8

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Nov. 21st.	Rise + or Fall	Present Yield p.c.
	*					£ s. d.
Metropolitan Railway Consol.	100	1⅜	2†	42½ — 43½	+ ½	3 8 7
Do. Surplus Lands	100	2½	3†	65 — 67	..	4 9 1
Do. 3½ % Deb.	100	3½	3½	89 — 91	..	3 17 0
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	..	29½ — 30½	— ½	Nil
Do. 6 % Deb.	100	6	6	144 —146	..	4 2 2
Do. 4 % Deb.	100	4	4	96 — 98	..	4 1 8
Do. 4 % Prior Lien	100	4	4	100 —102	+1	3 18 5
Do. 4½ % First Pref.	100	3½	4½†	88 — 90	+2	3 12 3
Do. 3½ % Gtd.	100	3½	3½	74 — 76	+1	4 12 1
Metropolitan Elec. Trams, Ord.	1	5½	5†	37/32 — 39/32	..	5 12 4
Do. Def.	1	Nil	..	1/32 — 3/32	..	Nil
Do. 5 % Pref.	1	5	5	37/32 — 39/32	— 1/32	5 3 1
Do. 4½ % Deb.	100	4½	4½	100½—102½	..	4 7 10
Do. 5 % Deb.	100	5	5	100½—102½	+ ½	4 17 7
Potteries, Ord.	1	2	..	1/32 — 3/32	+ 1/32	..
Do. 5 % Pref.	1	5	5	1/32 — 3/32	..	6 10 0
Do. 4½ % Deb.	100	4½	4½	87½ — 90½ xd	..	4 17 2
South Metro. Trams, 6 % Pref.	1	6	..	⅜ — ½	..	6 17 2
Do. 4 % Deb.	100	4	4	72 — 77	..	5 3 11
Underground Elec. Railways	10	..	..	1⅞ — 2⅛	..	..
Do. 4½ % Bonds	100	4½	4½	100 —102	..	4 8 8
Do. 6 % Income	100	1	1½†	63 — 65	—1	1 10 9
Do. Power House Debs.	100	4	4	100 —102	..	3 18 5
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	Nil	..	2⅛ — 2⅜	..	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½†	4⅞ — 5⅛	..	4 16 5
Do. 2nd Pref.	5	5	5½†	4⅜ — 5	..	5 0 0
Do. 4 % Deb.	100	4	4	93½ — 95½	..	4 8 9
Do. 4½ % Deb.	100	4½	4½	102 —104	..	4 6 7
Do. 5 % Deb.	100	5	5	100½—102½	..	4 18 0
Auckland Trams, 5 % Deb.	100	5	5	104 —107	+1	4 13 6
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅞ — 11⅛	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	97 — 99	..	4 10 11
Do. 5 % 2nd Deb.	100	5	5	98½—100½	..	4 19 6
Brisbane Trams Invt., Ord.	5	8	8†	7⅝ — 8	+ ⅛	5 0 0
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	..	143 —147	..	5 8 10
Do. Pref. Ord.	100	6	6	124 —128	..	4 13 9
Do. 5 % Pref.	100	5	5	109½—112½	..	4 8 11
Do. 4½ % 1st Mort. Deb.	40	4½	4½	99 —102	..	4 8 8
Do. 4½ % Vancouver Deb.	100	4½	4½	102 —104	..	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	102 —104	..	4 6 7
Calcutta Trams, Ord.	5	6	..	5⅝ — 6⅛	— ⅛	4 18 2
Do. 5 % Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
Cape Electric Trams	1	Nil	2½†	7/32 — 9/32	..	4 0 0
City Buenos Aires Trams (1904)	5	5	5	5⅜ — 5¼ xd	..	4 5 1
Do. 4 % Deb.	100	5	5	97 —100	..	5 0 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	93 — 98	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	101½—104½	..	4 15 8
Kalgoorlie Elec. Trams	1	Nil	..	1/32 — 3/32	..	Nil
Do. 5 % A Deb.	100	5	5	92⅝ — 95⅝	..	5 4 9
Do. 6 % B Deb.	100	5	6†	62 — 66	..	7 11 6

La Plata Elec. Trms, Prf.	1	6	6	29/32 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6†	1 — 1⅛	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	96 —100	..	5 0 0
Madras Elec. Tr. (1904), Deb.	100	5	5	96 — 99	..	5 1 0
Manaos Trams & Lt., 1st Deb.	100	5	5	92 — 94	..	5 6 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	99 —101	+1	4 19 0
Mexico Trams Con.	$100	7	7†	123 —125	—2	5 12 0
Do. Gen. Con. 5 % Bonds	..	5	5	98½—100½	..	4 19 6
Do. 6 % Bonds	100	6	6	103 —105	..	5 14 3
Para Elec. Rlys. & Lt., Ord.	5	10	10†	6⅞ — 7⅛	..	6 18 0
Do. 6 % Pref.	5	6	6	5⅛ — 5⅜	..	5 4 4
Do. 5 % 1st Deb.	100	5	5	99½—101½	..	4 18 6
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	1/32 — 1/16	..	2 7 1
Do. 5 % 1st. Deb.	100	5	5	101½—103½	..	4 16 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅛ — 5⅜	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	98 —101	..	4 9 1
Rio de Janeiro Trams	$100	4½	5†	115 —116	—1½	4 6 2
Do. 1st Mort. 5 % Bonds	..	5	5	101⅜—102⅜	+ ⅛	4 17 4
Do. 5 % Mort. Bonds	100	5	5	95⅝ — 96⅝	..	5 2 8
Sao Paulo Tram, Lt. and P.	$100	10	10†	185 —189	—2	5 5 10
Do. 5 % 1st Deb.	$500	5	5	104½—106½	..	4 13 11
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96½ — 97½	..	5 2 7
Un. Elec. Trams Monte Video	5	6	7	5⅞ — 6	..	5 0 0
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	99 —102	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	104 —106	—2	4 4 11

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	3/32 — 5/32	+ 1/16	Nil
Do. 6 % Pref.	1	9	6	3/32 — 5/32	..	7 2 2
Babcock & Wilcox	1	26	24†	6 — 6⅛	— ⅛	4 6 8
Do. Pref.	1	6	6	1⅛ — 1½	..	4 0 0
B.I. & Helsby Cables	5	10	8†	6⅞ — 7¼	..	6 17 11
Do. Pref.	5	6	6	5⅞ — 6¼	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 97	..	4 12 9
British Westinghouse, Pref.	3	Nil	..	⅛ — ⅜	..	Nil
Do. Deb.	100	4	4	57 — 60	..	6 13 4
Do. 6 % Prior Lien	100	6	6	100 —102	..	5 17 8
Browett, Lindley, Ord.	1	Nil	..	1/6—2/-	..	Nil
Do. Pref.	1	Nil	..	5/- —6/-	..	Nil
Brush, Ord.	2	Nil	..	0 — ¼	..	Nil
Do. 7 % Pref.	2	Nil	..	0 — ¼	..	Nil
Do. 4½ % Deb.	100	4½	4½	56 — 61	..	7 7 7
Do. 4½ % Second Deb.	100	4½	4½	39 — 44	..	10 4 6
Callender's Cable	5	15	10†	9 — 9⅜	..	7 13 10
Do. Pref.	5	5	5	5 — 5⅛	+ 1/16	4 15 3
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
Castner-Kellner	1	17½	20	31/32 — 1 1/16	+ 1/16	5 5 3
Do. Deb.	100	4½	4½	104 —108	..	4 3 4
Crompton & Co.	3	Nil	Nil	⅛ — ⅜	..	Nil
Do. Deb.	100	5	5	60 — 67	+3½	7 9 3

Dick, Kerr	1	5	..	3/32 — 5/32	..	5 14 3
Do. Pref.	1	6	6	1⅛ — 1⅜	..	5 12 11
Do. Deb.	100	4½	4½	95 — 98	..	4 11 10
Edison & Swan, A, £3 paid	5	Nil	..	3/32 — 5/32	+ 1/16	Nil
Do. fully paid	5	Nil	..	1⅛ — 2⅜	..	Nil
Do. 4 % Deb.	100	4	4	69 — 73	..	5 9 7
Do. 5 % Second Deb.	100	5	5	77 — 80	..	6 5 0
Electric Construction	2	Nil	2½†	⅛ — ¼	..	6 13 4
Do. Pref.	2	7	7	1⅝ — 2	— ⅛	7 0 0
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8½	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	9 — 9½	..	5 5 3
Do. Deb.	100	4	4	86 — 91	..	4 7 11
Henley's, Ord.	5	15	10†	11⅞ — 12⅜	..	5 18 10
Do. Pref.	5	4½	4½	4⅞ — 5⅛	..	4 5 11
Do. Deb.	100	4½	4½	106½—108½	..	4 2 7
India-Rubber, G. & T.	10	10	..	12½ — 14½	..	6 17 11
Do. Pref.	10	5	5	9⅝ — 10⅜	..	4 16 5
Telegraph Construction	12	20	10†	35 — 37	—1½	6 7 5
Do. Deb.	100	4	4	100 —102	..	3 18 5
Willans & Robinson	1	Nil	..	1/32 — 3/32	..	Nil
Do. Pref.	5	Nil	..	¼ — ⅜	..	Nil
Do. Deb.	100	4	4	55 — 65	..	6 3

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

The yields are calculated upon the dividends paid for 1910.

Bank rate of Discount 4 per cent., September 21st, 1911.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING OCTOBER, 1911.

After the somewhat meagre business of September, the October returns of electrical export trade are surprisingly good. For the month the total value of the exports amounted to £464,191, this being a higher value than has so far been recorded this year, and very satisfactory in that neglecting the telegraphic section there remains the substantial amount of £394,000, representing general business. Increased values appear generally in all sections of the exports; machinery accounted for over £170,000, while cable exports reached over £90,000 in value.

By a further sub-division of the returns, accurate values of both the exports and imports of electric glow lamps are shown; the former approached £14,000 in value, while the latter figures at £28,526.

The imports totalled £221,289, a somewhat higher figure than in the preceding month; machinery imports amounted to over £87,000 in value, while telegraphic and telephonic material (Germany and Belgium sending the bulk of this) reached a total of £58,000.

Of our customers during the month, India, Argentina, Japan, our Australian Colonies and Spain (due to a comparatively large telegraphic purchase) deserve mention, improved business is, however, apparent in many directions.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	1,232	1,440	177	224	27	1,235	8,696	2,368	130	...	1,378	413	17,320
Germany and German W. Africa	1,702	342	75	...	667	10	2,918	53	...	...	25	47	5,839
Netherlands, Java and Dutch Indies ...	582	1,119	150	60	...	...	436	645	39	...	6	8	3,045
Belgium	412	336	19	14	305	80	1,450	18	30	...	1,585	11	4,260
France	1,108	13	1,690	15	61	146	2.516	3,690	2	...	224	42	9,507
Portugal	37	51	19	92	...	...	575	240	61	...	...	...	1,075
Spain and Canary Isles	818	54	365	10	12	196	1,984	148	1	5	2	30,862	34,457
Switzerland, Italy and Austria-Hungary ...	590	28	1,397	...	38	15	1,859	876	51	13	21	...	4,888
Greece, Bulgaria, Roumania and Turkey ...	22	33	68	29	24	3	236	26	21	...	4	75	541
Channel Isles, Gibraltar and Malta... ...	23	42	40	35	...	5	557	950	27	...	151	156	1,986
U.S.A., Philippines and Cuba	72	...	34	288	...	161	1,032	...	...	1,034	...	320	2,941
Canada and Newfoundland	831	6,297	1,543	1,817	40	2,549	7,437	140	218	52	499	84	21,507
British West Indies and British Guiana ...	38	39	58	24	...	594	552	...	25	...	29	12	1,371
Mexico and Central America	144	115	49	90	...	...	276	250	8	...	...	...	932
Peru, Uruguay and Paraguay	104	351	249	120	44	60	483	148	31	...	4	669	2,263
Chile	937	145	321	888	134	153	2,612	526	50	80	320	31	6,197
Brazil	551	896	817	690	87	650	7,210	678	344	...	4,028	13,919	29,870
Argentina	2,758	4,472	993	2,853	403	381	20,132	359	4,734	40	4,818	1,991	43,934
Colombia, Venezuela, Ecuador and Bolivia	36	230	216	...	...	4	407	4	22	...	...	340	1,259
Egypt and Persia	1,530	1,556	334	14	18	47	4,041	378	416	...	311	2,072	10,717
British West Africa	365	35	62	117	...	...	156	32	2	...	205	50	1,024
Rhodesia, O.R.C. and Transvaal	2,088	181	287	1,254	207	75	3,619	45	44	...	25	229	8,054
Cape of Good Hope	1,575	1,325	443	767	130	96	3,548	...	1,408	52	55	935	10,334
Natal	1,598	9,519	181	167	60	47	762	335	241	55	349	75	13,389
Zanzibar, Brit. E. Africa, Mauritius & Aden	199	127	89	135	17	227	416	...	22	...	56	255	1,543
Azores, Madeira and Portuguese Africa ...	262	237	224	59	...	165	86	2,250	52	...	21	181	3,537
French African Colonies and Madagascar ...	...	80	25	...	...	...	528	...	...	...	...	148	781
China and Siam	730	2,116	337	979	144	216	2,259	65	42	...	35	...	6,923
Japan and Korea	1,207	6,360	250	...	...	650	20,952	1,443	242	...	3,229	8,320	42,653
India	5,590	12,983	4,228	342	456	2,295	17,737	3,480	5,020	39	1,515	1,018	54,703
Ceylon	192	90	126	61	...	7	686	44	288	...	332	69	1,895
Straits Settlements and Fed. Malay States	468	349	193	57	...	13	968	36	312	...	132	180	2,708
Hong Kong	16	32	13	...	...	130	455	11	74	20	...	32	783
West Australia	382	168	67	346	...	45	1,185	...	152	29	240	52	2,666
South Australia	428	7,435	309	179	...	711	200	31	405	...	95	...	9,793
Victoria	2,823	18,033	583	399	207	79	3,503	10	218	141	4,848	52	30,896
New South Wales	2,284	12,412	1,100	1,047	193	372	11,286	371	1,062	...	668	4,069	34,864
Queensland	206	416	59	...	78	293	5,002	...	71	...	5,293	948	12,366
Tasmania	15	...	...	23	...	100	621	...	...	...	25	...	784
New Zealand and Fiji Islands	1,322	2,007	532	582	...	154	11,899	515	1,019	67	49	2,440	20,586
Total, £	35,277	91,464	17,722	13,777	3,352	11,965	151,277	20,165	16,884	1,627	30,577	70,105	464,191

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	482	...	6	55	...	...	3,955	34	599	...	8,200	13,331
Germany	2,425	6,555	1,747	23,143	6,399	2,104	56,813	805	2,324	6,640	34,851	143,806
Holland	6	...	...	1,070	611	...	186	10	...	44	13	1,940
Belgium	287	2,292	7	53	...	266	1,582	37	610	429	11,623	17,186
France	60	152	1,059	657	461	446	1,048	200	968	3,359	715	9,125
Switzerland	204	162	16	54	48	64	9,062	...	...	...	32	9,642
Italy	21	561	...	...	...	...	...	...	...	...	2,496	3,078
Austria-Hungary	...	520	...	623	...	91	1,112	...	19	219	12	2,596
United States	3,837	67	10	2,871	383	...	5,648	6,736	125	114	278	20,069
Total, £	7,322	10,309	2,845	28,526	7,902	2,971	79,406	7,822	4,645	10,805	58,220	220,773

Additional imports: Spain, carbons, £420; Canada, goods, £96.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above ...	10,705	2,661	...	1,898	277	...	4,662	...	280	407	830

Total Exports: £464,191. Total Re-Exports: £21,720. Total Imports: £221,289.

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

A GENERATOR FOR HIGH-FREQUENCY WIRELESS TELEGRAPH CURRENTS.

By S. M. POWELL.

Alternating currents of frequencies lying between 30,000 and 100,000 cycles per second are required in the operation of wireless telegraph circuits, and it is—for long-distance work—essential to obtain *very considerable amounts of power* at this high frequency, and from a *steady source* (the latter stipulation being most important in wireless telephony).

The output which can be obtained from spark and arc sources of high-frequency alternating current is limited in amount, and the steadiness of these sources is imperfect at large outputs. Endeavours have therefore been made during recent years to generate suitable current in dynamo-electric machines, thus avoiding the use of spark and arc sources, and enabling more power to be supplied to the aerial simply by increasing the output of the prime mover.

High-frequency alternators may easily be built, but it is extremely difficult to obtain a large kw. output from such machines. A single example will demonstrate this difficulty and explain its exact nature.

Assuming a peripheral rotor velocity of 80 m./sec.—a value seldom exceeded—the pole pitch T of a 30,000-cycle alternator is :—

$$T = \frac{80{,}000}{2 \times 30{,}000} = 1{\cdot}33 \text{ mm.}$$

Now $T = (A + B + 2C)$ (see fig. 1),

and at high voltages the thickness of insulation (2 C) soon approaches the full available width (T), leaving a totally insufficient peripheral thickness for copper (A) and iron (B).

Even supposing the above peripheral velocity to be doubled, the output of the machine could not be proportionately increased, for at small slot pitches, the permissible slot depth is limited, both by mechanical stresses and by

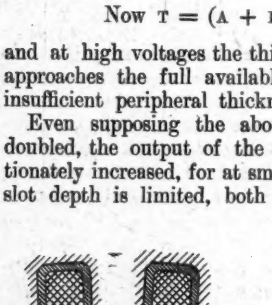

Fig. 1.

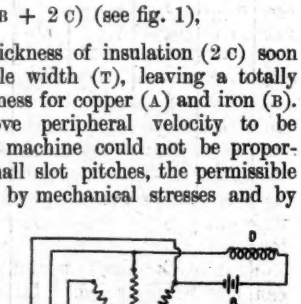

Fig. 2.

magnetic flux density. In the field system, the higher flux density would merely require higher excitation and saturation of the iron, but in the armature it would entail greatly increased hysteresis and eddy-current losses—particularly at the enormous frequencies proposed. Again, small poles necessitate short air gaps, which are highly undesirable from a mechanical point of view.

Prof. Arnold,* however, has devised an arrangement by which high frequency and large output may be simultaneously secured ; his machine, moreover, has proved very satisfactory in practice. Its theory may be explained as follows :—

Referring to fig. 2, R represents the rotor, and S the stator of a machine built like an induction motor. The rotor slip-rings are electrically connected to the stator terminals. Into S or R, or both simultaneously, direct current is fed from the battery B, which is protected from alternating current by the choking coil D. Suppose the rotor to be rotated at ω radians per second (reduced to a two-pole basis), then currents of frequency f are set up in R (f being the frequency corresponding to ω). Now, R and S are connected through condensers C, C, C, which prevent the passage of direct current from B to R, but allow the alternating current generated in R to flow into S, where it sets up a rotary field. The connections between R and S must be so arranged that the rotary field in S turns *oppositely* to the rotor R, and hence has a velocity of 2ω relative to the latter. Currents of frequency $2f$ are then induced in R, and flowing through the stator, set up in turn currents of $3f$ frequency, and so on. Theoretically, infinitely high frequencies could thus be derived.

The arrangement of fig. 3, however, represents the actual practical form of the apparatus in its essential features. Stator and rotor have now single-phase windings ; the rotor is short-circuited on itself and the stator is short-circuited, *for alternating current only*, by the large condenser C. On connecting S with a direct-current source and rotating R, a current of frequency f is set up in the latter. Calling R the "primary," and imagining the alternating field set up by

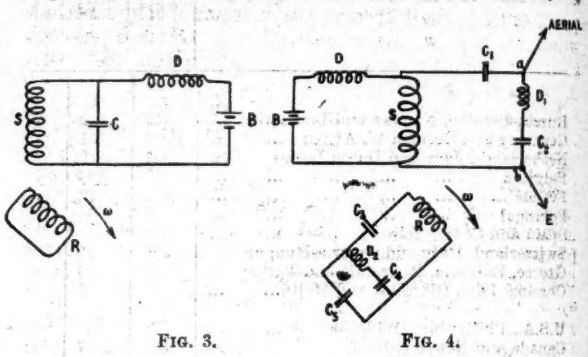

Fig. 3.

Fig. 4.

the rotor current to be resolved into two parts, rotating in opposite directions and with angular velocity ω relative to the rotor—one of these components clearly stands still in space, and forms the rotor reaction on the D.C. excited stator field ; the second component revolves in space with angular velocity 2ω and induces currents of frequency $2f$ in the stator winding. This current, again, may be resolved into a "reaction" and "action" component ; the latter induces currents of frequency $3f$ in the rotor, and thus again infinite frequencies may ultimately (theoretically) be generated.

In the latter arrangement, inductive coupling is employed to enable the to and fro transference of energy between the primary and secondary necessary to raise the frequency, whereas in fig. 2 the transference is obtained by actual electrical coupling. It is characteristic of the arrangement of fig. 3 that rotor and stator are alternately the "primary."

At first sight, it might be thought that only higher harmonics could be produced by this means, *i.e.*, relatively small oscillations such as are obtained (as "by-products") in all alternating-current machines by the non-sinusoidal form of the field flux and the armature windings, and such as are created in single-phase generators by the interaction of field and armature.* Clearly, however, this is not the case, *if* care be taken that all the lower frequencies flow in closed short-circuits, only the utilised frequency being driven through the resistance of the antenna and other working circuits ; in fact, by "resonant short-circuiting" (see below) we obtain frequency *sorting* without *wasting* the unsuitable frequencies. The machine then constitutes a permutator, changing lower to higher frequencies with very considerable efficiency. The power output increases to a known limit with rising frequency, for, at each increase of frequency, more of the mechanical energy in the system is converted to electrical oscillations. Without a short-circuit for the "dead" frequencies, the high-frequency currents would become ever weaker, and it would be impossible to obtain large amounts of energy in the signalling circuits.

The fact that the increase of frequency is effected in a single machine, brings with it the advantage that the "action" component of frequency $(n \cdot f)$ is nearly wiped out by the "reaction" component of frequency $(n + 1) \cdot f$†. Only the last field, created by the highest frequency (and

* *Elektrotechnische Zeitung*, January 19th, 1911

* Arnold, *Wechselstromtechnik*, IV, pp. 25 *et seq.*

†As with the currents, so with the fields, there is really only the complex *resultant* in each case.

therefore the "useful" field) exists in full strength, and therefore it alone creates the full iron loss due to this hypothetical component. (See footnote.) This cancellation of the low-frequency fields is the more complete, the freer from damping the various circuits.

The stator and rotor windings may be likened to stationary and rotating mirrors; between them electrical energy is "reflected" to and fro just as light rays would be in the analogy cited. The reflection occurs at increasing frequency, and is the more complete, the less the energy absorbed by the "mirror" or, here, the freer the various oscillating circuits from damping. (It is suggested that, by this analogy, the new machine should be called a "reflection generator.")

Where alternating current is concerned, a "complete short-circuit" does not mean a simple wire coupling, but a short-circuit through a condenser, which permits the flow of alternating current through itself and automatically compensates (if properly chosen) the inductance of the machine windings. How this compensation is obtained may be gathered from fig. 4, which closely represents the actual practical arrangement of the generator.

Suppose, for example, that the quadruple frequency $4f$ is to be employed. The stator S is supplied with direct current through the choking coil D. The rotor current of frequency f then flows *viâ* R, C_3, D_3, C_4, R. The condenser C_3 is so chosen and connected that it counterbalances the inductance of R; and D_3, C_4 are exactly in resonance at the frequency f. The induced stator currents of $2f$ frequency flow *via* C_1 (which is proportioned to the inductance of S), D_1, C_2; C_2 and D_1 are syntonic with frequency $2f$. The rotor currents of frequency $3f$ flow *via* the condenser C_5 (tuned to this frequency). The currents of frequency $4f$ have to be usefully employed (by hypothesis), and may be wholly led off from the points *a b* (fig. 4). Since D_1, C_2 is out of tune for the frequency $4f$, only an extremely small current of quadruple frequency will flow *via* this short-circuit to the aerial; D_1, C_2 are, however, sharply tuned to the frequency $2f$, so that practically no P.D. of $2f$ frequency exists between *a* and *b*. It should be noted that the addition of C_5 does not disturb the resonance of the rotor circuit to the frequency f, nor the connection of the aerial the syntony of the stator circuit. It is because C_1, C_2 are tuned to the machine windings that the circuits remain in resonance, alike whether D_1, C_2 and D_3, C_4 are short-circuited or open.

The first machine, to be built on this plan has been operating since April, 1910, in the Lorenz radio station at Eberswalde. The output of the machine is about 12½ KW. when supplying a 10,000-metre wave, and at the shorter wave length of 5,000 metres, 8 or 10 KW. output may still be obtained. It appears that machines of 60-80 KW., or even greater output, can be built on this system to supply frequencies as high as that corresponding to 3,000 metres wave length. The efficiency of the machine (on a 10,000-m. wave) is about 80 per cent., and a special advantage is that, by simple variations, a large number of frequencies may be obtained. The finer gradations of wave length are obtained by special tuning apparatus as usual.

The Lorenz Co. (Berlin) have been very largely responsible for the successful development of this interesting and valuable machine, and the German patents covering its manufacture are in their name.

Finsbury Technical College O.S.A.—The sixth annual dinner of this Association will be held at the Trocadero Restaurant, Piccadilly Circus, on Saturday, December 9th, at 7 for 7.30 p.m. Mr. Reginald Wallis-Jones, the president, will take the chair. The dinner is being held on a Saturday in order to enable provincial members to attend. Particulars can be obtained from Mr. H. F. Knight, 64, Amhurst Park, Stamford Hill, one of the secretaries. The annual dance is to take place at the Caxton Hall, Westminster, on Saturday, February 3rd, 1912, a smoking concert following in March. Mr. H. W. Gregory (1, Atherton Road, Forest Gate, E.), the electrical honorary secretary, announces the formation of a dining club amongst the members. The club dinners take place once a month and they are strictly limited to members.

Bonus to Tramway Employés.—In recognition of the loyalty of their employés, the Bristol Tramways and Carriage Co., Ltd., distributed to every employé in all departments of the service last week an addition of half-a-week's pay at full rate.

BRAZIL: ITS PRESENT CONDITIONS AND THE POSSIBILITIES FOR FUTURE COMMERCIAL RELATIONS WITH GREAT BRITAIN.

By C. E. BEST and H. L. PARROTT.

(*Continued from page* 805.)

Mineral Wealth of Brazil.—There are but few people who are aware of the enormous wealth of various minerals which Brazil holds within her bosom. Yet it is a country comparatively easy to travel in. Mining concessions are not difficult to obtain from either Federal or State Governments, while property can be purchased from private owners at very low prices.

It was the early Portuguese settlers who first established for Brazil the reputation as a country of vast latent mineral riches. When we consider the tremendous difficulties with which these early pioneers had to contend, we may well admire their dogged courage and indomitable endurance in overcoming every barrier between them and their ambition. In those days—the sixteenth and seventeenth centuries—it is true that there were the dangers of unexplored tropical forests, infested with ferocious animals, as well as the indigenous natives, whose barbarian cruelty and vindictive nature might justly cause the boldest to hesitate.

The first signs of the presence of gold were manifested by the natives themselves, who adorned their persons with gorgeous ornaments of gold.

After the early dealings between the Portuguese and the more docile Indians, the settlers demanded that the natives should take them to the locality where gold was to be found. The natives at first, however, refused, "whereupon one of the Portuguese poured out some spirit (which the natives assumed was water) from his flask and set fire to it, saying that he and his comrades would set fire to all the rivers in their country if they did not show them where gold was to be found!"

Even so, the hardship which these early settlers endured can only be imagined. In some respects it would appear that a comparison of their endeavours with those of many of the present generation might make us appear somewhat timid and half-hearted.

In those days they could have had no certainty that they would strike wealth and success. They had no maps prepared for them with full and graphic accounts of the whole country and its conditions.

We know of many excellent and well-established firms in England who are apparently anxious to develop their export trade and open up agencies abroad. But before they embark upon such a "hazardous enterprise" (!) they want others to give them a practical guarantee of success. So while they remain quietly at home waiting for the "indisputable" facts to convince them, there are many from other countries who go boldly there and establish themselves—and naturally take success in both hands.

When our friends at home realise this, they calmly say, "Well, now it is too late; there can be no chance now, as others are already established there, and have obtained the best business."

Last year one of the writers visited some alluvial gold mines which are now being opened up and worked by a British company. It will give an idea of the distance from the coast, to state that after two days' journey by rail it took 23 days' riding on horseback to reach the seat of mines.

Our friend, the chief engineer, is an Australian miner, who, during a visit in South America, met an Englishman who owns some property containing alluvial gold in the locality. The mining engineer first undertook the journey to this property in order to make a report on the mine. Although satisfied with it, he took the opportunity to prospect round about, when he came across unmistakable signs of old placer workings of the Portuguese settlers (Antigos). After spending nearly 12 months exploring that part of the country, he acquired options on private properties to extent of some 70,000 acres, as well as Government concessions to extent of 80,000 acres. Thereupon our friend returned to Sao Paulo,

and, although scarcely known in Brazil, he found no difficulty in raising sufficient capital from among the English colony there to purchase efficient plant, pay for transport, and commence operations.

There are several small rivers running through the company's property, all flowing into one of the main tributaries south of the Amazon. In all the rivers gold is to be found, usually in a sufficient quantity to pay a handsome profit over and above all working expenses. In the main river, some six miles distant from the centre of present operations, there is a big fall, there being some 25-30 ft. difference in the level within a stretch of ¼ mile of the river. As its rocky bed is visible in several places, it presents but little difficulty to control its waters and generate electric power. The engineer calculates that there is sufficient latent power to drive 20 different plants for hydraulicing the alluvial gold. The company have already obtained the concession from the State Government permitting them to utilise this natural force. These are actual facts, and we are glad to inform our readers that British enterprise was to the fore in this case.

There are many other excellent propositions which only await men with the spirit of pioneering and enterprise.

In commercial undertakings firms must liberate themselves from all rigid and conservative *régime*, and adapt themselves more to present demands. British engineering firms might acquire many valuable concessions and contracts for public works if they were more enterprising, and did not wait for projects to be brought to them.

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A representative should be a man of culture and ability, with a good knowledge of the Portuguese, and even the French language, in order that he may mix with the Brazilians and get acquainted socially with the more important and influential men. This will necessitate the payment of salaries which stay-at-home English firms might think exorbitant, at the least £500 to £800 per annum, with freedom to incur further expenses which may be considered necessary.

In this respect we may remark that several German firms have representatives travelling in Brazil to whom they pay a salary of £65 per month, plus all expenses, both hotel and travelling. And this is simply to acquire ordinary trade! Naturally they are proving very successful, and paying handsome profits on the comparatively small outlay.

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The average Englishman who regards himself and his country as beyond reproach and all comparison with others, may well keep his own counsel on the matter. He can never make friends abroad by expressing such opinions. The Brazilian has a very sensitive nature, and is justly proud of his country and the achievements of his countrymen, and is usually satisfied with his own opinion.

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At all seasons of the year warm weather will be encountered during the journey, as well as in Brazil itself. So it is well to prepare an outfit suitable to the conditions of place and season. Ordinary thin summer suiting will generally be most suitable, with thin under-clothing, woollen or otherwise, according to the taste of the person wearing same, although we favour wool.

Apart from this, from three to six white linen or drill suits are practically essential, while a panama hat is a boon during the hot weather. Hard and soft felt hats, as well as ordinary straw, are all in general fashion.

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according to his requirements and taste, he can arrange for hotel accommodation from 12s. 6d. up to 20s. per day.

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On arrival in Rio, the traveller will readily see the renowned "Central" Avenue. It was upon this grand thoroughfare that the chief efforts of the municipality were centred when the city was remodelled, six years ago. This is a wonderful example of Brazilian enterprise, and it seems absolutely incredible that this magnificent avenue could have been built in the short space of 18 months. It is interesting to note the different types of architecture in the palatial edifices that line each side of the street, which well illustrate the original and independent tastes of the Brazilian.

The new municipal theatre, situated in the Avenue, immediately attracts one's attention. It is said that, in its magnificent appearance and its spacious dimensions, with a seating capacity for some 20,000 persons, it vies with the Paris Opera House, while the arrangement of the electric illumination, both in the body of the theatre and on the stage, is the last word in lighting effects.

The most conspicuous of the new buildings on the Central Avenue is the Monroe Palace, in which were held the sessions of the Pan-American Congress in 1906. Its artistic design attracts universal admiration, and reflects great credit on the architect.

One other great feature of beauty in Rio is the new esplanade, called the "Avenida Beira-Mar." Much of this has been built on ground reclaimed from the sea along the Bay of Botofogo.

This is not the place to enlarge on the exceptional wealth of natural beauty around Rio, but we recommend the traveller to utilise his leisure and see for himself.

In future articles we shall give sketches of some of the chief towns along the coast of Brazil, and describe their geographical positions and extent of commerce, pointing out many of the improvements relating to electricity which must necessarily take place shortly.

(To be continued.)

LOANS FOR ELECTRICITY SUPPLY AND OTHER PURPOSES.

The L.C.C. and the Local Authorities in London.

The Finance Committee of the L.C.C. has just submitted to the Council a very interesting report as to the powers and duties of the Council in respect of sanctioning loans and lending money to local authorities, with special reference to loans for electricity purposes.

The Council is the sanctioning authority for most of the loans raised by the Metropolitan Borough Councils, subject, since 1900, to the right of Borough Councils to appeal, under the London Government Act, 1899, to the Local Government Board against refusal of sanction or against conditions imposed by the Council in granting the sanction.

The Local Government Board, however, is the sanctioning authority in respect of loans for certain purposes under special Acts of Parliament. The power of a Metropolitan Borough Council to borrow must be derived from some statutory enactment enabling it to borrow to defray any particular expenditure, and the sanction of the Council, or the L.G.B., as the case may be, is a condition precedent to the Borough Council being able to put into force its borrowing powers conferred by Statute.

The preliminary questions, therefore, in the case of every application for a loan are whether the Borough Council has statutory authority to incur the expenditure in question and to borrow to defray the same. If the Borough Council does not possess the necessary powers, the Council does not, of course, issue a sanction; but if it is armed with the required authority, the questions whether or not the Council shall sanction, and the amount of the sanction, become matters within the discretion of the Council, and it is entitled to give or refuse the sanction, subject to the right of appeal which we have mentioned.

Before the L.C.C. Finance Committee recommends sanction to a loan it requires to be satisfied—

1. That the financial position of the borough warrants the proposed increase of indebtedness.
2. That the amount is not in excess of the reasonable cost of the work.
3. That the work is necessary, and is such as to justify the cost being spread over a period of years.
4. That the loan will be repaid during the life of the work, so as to preclude the possibility of future ratepayers being saddled with the cost of exhausted works.

And in connection therewith the following are some of the principal points considered:—

1. The outstanding indebtedness of the Borough Council.
2. The assessable annual value of the borough.
3. The total of the local and county debt chargeable on the rates of the borough, and the percentage which this debt bears to assessable value, and the amount of this percentage which is in respect of unremunerative debt.
4. The amount of the local rates in the £.

The Council's security for loans advanced is in all cases a mortgage of the local rates. With regard to loans advanced for revenue-producing undertakings, the revenue is charged by the local authority with the service of the loan, so that in such cases the revenue of the undertaking constitutes, in fact, the primary security with the local rates behind it, although in law the security for the loan is the rates only.

Attention is drawn to the fact that owing to the unrivalled facilities of the central financial authority (the L.C.C.) for raising and advancing moneys, local authorities could only raise money for themselves at a higher cost, that they would have to incur the expense of floating such loans, and the risks attendant upon the management of the sinking funds, which under present conditions are borne by the Council, whilst the prospects of their success in this direction are problematical, even in the case of the largest local authorities. Moreover, a very considerable proportion of their loan requirements are for periods not exceeding 20 years, and are therefore appropriately met by mortgage loans rather than by the issue of stock.

The London Electricity Supply Act, 1908, has created a special position with regard to loans for electricity undertakings, and one of the elementary requirements of the Council is that the loan shall be repaid within the life of the works for which it is required. For buildings for electricity supply purposes the maximum period is 50 years, which is supposed to be within the estimated "life."

Up to 1906 most of the loans for electric lighting purposes were sanctioned for an all-round term of 42 years (although this period exceeds the probable life of some of the items for which such loans were required), subject to the condition imposed by the Treasury that if any renewals were necessary during the 42 years' term the cost of such renewals should constitute a maintenance charge, and should not be made the subject of a fresh loan. Different periods, not exceeding the life of the works, are now allowed for various items comprised in loans for electricity purposes, the period for plant and machinery being 20 years. The Council, as opportunities occur, endeavours to induce Borough Councils which have raised loans for 42 years to reduce the outstanding periods of repayment of such loans.

It will be remembered that the Select Committee on the Repayment of Loans by Local Authorities, which reported in 1902, stated that it considered it to be the duty of a department in deciding the question of the period for repayment, as apart from the question whether any loan should be permitted, to consider more closely the durability than the desirability of the works or purposes for which the loan was required, and to use very considerable caution in fixing the period.

During the year 1910-11 the total amount borrowed by the Borough Councils from the L.C.C., or the central financial authority, was £335,436, and £77,343 was raised elsewhere under the Council's sanction; but these sums do not necessarily represent the total borrowings of the Councils. Of this £77,343, £51,054 was taken up from the Borough Councils' bankers, the loans being mostly subject to repayment at six months' notice; but they were loans made under the Council's sanction, and complying with the sanction as to periodical repayment by instalments. This method of borrowing is not regarded by the Finance Committee as altogether satisfactory, as in the event of a period of financial stress occurring the banks would probably exercise their options to call in the loans, and borrowers would then be compelled to raise money elsewhere to discharge their obligations to the banks. Further, from the point of view of economy, it is undesirable to give local authorities cause to look to other means of raising money, such as the issue of local stocks, short-term mortgages and debentures, or taking money on deposit.

The following table shows the loans sanctioned by the Council in the case of Metropolitan Borough Councils for the 10 years ended March 31st, 1911, for electricity undertakings (including meters and street lighting with electricity) and the electric wiring of consumers' premises, and providing electrical apparatus. The table does not include, of course, any loans sanctioned by Act of Parliament in respect of which the Council's sanction to the borrowing was not requisite, or loans sanctioned by the Treasury or the Local Government Board:—

1901-2	£577,998	1907-8	£275,518
1902-3	545,727	1908-9	184,905
1903-4	241,007	1909-10	129,580
1904-5	732,629	1910-11	183,325
1905-6	320,299		
1906-7	255,104	Total ...	£3,446,092

From this it will be seen that there has been a large decrease during the last few years, which observation applies to loans under all heads.

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The new municipal theatre, situated in the Avenue, immediately attracts one's attention. It is said that, in its magnificent appearance and its spacious dimensions, with a seating capacity for some 20,000 persons, it vies with the Paris Opera House, while the arrangement of the electric illumination, both in the body of the theatre and on the stage, is the last word in lighting effects.

The most conspicuous of the new buildings on the Central Avenue is the Monroe Palace, in which were held the sessions of the Pan-American Congress in 1906. Its artistic design attracts universal admiration, and reflects great credit on the architect.

One other great feature of beauty in Rio is the new esplanade, called the "Avenida Beira-Mar." Much of this has been built on ground reclaimed from the sea along the Bay of Botofogo.

This is not the place to enlarge on the exceptional wealth of natural beauty around Rio, but we recommend the traveller to utilise his leisure and see for himself.

In future articles we shall give sketches of some of the chief towns along the coast of Brazil, and describe their geographical positions and extent of commerce, pointing out many of the improvements relating to electricity which must necessarily take place shortly.

(To be continued.)

LOANS FOR ELECTRICITY SUPPLY AND OTHER PURPOSES.

The L.C.C. and the Local Authorities in London.

The Finance Committee of the L.C.C. has just submitted to the Council a very interesting report as to the powers and duties of the Council in respect of sanctioning loans and lending money to local authorities, with special reference to loans for electricity purposes.

The Council is the sanctioning authority for most of the loans raised by the Metropolitan Borough Councils, subject, since 1900, to the right of Borough Councils to appeal, under the London Government Act, 1899, to the Local Government Board against refusal of sanction or against conditions imposed by the Council in granting the sanction.

The Local Government Board, however, is the sanctioning authority in respect of loans for certain purposes under special Acts of Parliament. The power of a Metropolitan Borough Council to borrow must be derived from some statutory enactment enabling it to borrow to defray any particular expenditure, and the sanction of the Council, or the L.G.B., as the case may be, is a condition precedent to the Borough Council being able to put into force its borrowing powers conferred by Statute.

The preliminary questions, therefore, in the case of every application for a loan are whether the Borough Council has statutory authority to incur the expenditure in question and to borrow to defray the same. If the Borough Council does not possess the necessary powers, the Council does not, of course, issue a sanction; but if it is armed with the required authority, the questions whether or not the Council shall sanction, and the amount of the sanction, become matters within the discretion of the Council, and it is entitled to give or refuse the sanction, subject to the right of appeal which we have mentioned.

Before the L.C.C. Finance Committee recommends sanction to a loan it requires to be satisfied—

1. That the financial position of the borough warrants the proposed increase of indebtedness.
2. That the amount is not in excess of the reasonable cost of the work.
3. That the work is necessary, and is such as to justify the cost being spread over a period of years.
4. That the loan will be repaid during the life of the work, so as to preclude the possibility of future ratepayers being saddled with the cost of exhausted works.

And in connection therewith the following are some of the principal points considered:—

1. The outstanding indebtedness of the Borough Council.
2. The assessable annual value of the borough.
3. The total of the local and county debt chargeable on the rates of the borough, and the percentage which this debt bears to assessable value, and the amount of this percentage which is in respect of unremunerative debt.
4. The amount of the local rates in the £.

The Council's security for loans advanced is in all cases a mortgage of the local rates. With regard to loans advanced for revenue-producing undertakings, the revenue is charged by the local authority with the service of the loan, so that in such cases the revenue of the undertaking constitutes, in fact, the primary security with the local rates behind it, although in law the security for the loan is the rates only.

Attention is drawn to the fact that owing to the unrivalled facilities of the central financial authority (the L.C.C.) for raising and advancing moneys, local authorities could only raise money for themselves at a higher cost, that they would have to incur the expense of floating such loans, and the risks attendant upon the management of the sinking funds, which under present conditions are borne by the Council, whilst the prospects of their success in this direction are problematical, even in the case of the largest local authorities. Moreover, a very considerable proportion of their loan requirements are for periods not exceeding 20 years, and are therefore appropriately met by mortgage loans rather than by the issue of stock.

The London Electricity Supply Act, 1908, has created a special position with regard to loans for electricity undertakings, and one of the elementary requirements of the Council is that the loan shall be repaid within the life of the works for which it is required. For buildings for electricity supply purposes the maximum period is 50 years, which is supposed to be within the estimated "life."

Up to 1906 most of the loans for electric lighting purposes were sanctioned for an all-round term of 42 years (although this period exceeds the probable life of some of the items for which such loans were required), subject to the condition imposed by the Treasury that if any renewals were necessary during the 42 years' term the cost of such renewals should constitute a maintenance charge, and should not be made the subject of a fresh loan. Different periods, not exceeding the life of the works, are now allowed for various items comprised in loans for electricity purposes, the period for plant and machinery being 20 years. The Council, as opportunities occur, endeavours to induce Borough Councils which have raised loans for 42 years to reduce the outstanding periods of repayment of such loans.

It will be remembered that the Select Committee on the Repayment of Loans by Local Authorities, which reported in 1902, stated that it considered it to be the duty of a department in deciding the question of the period for repayment, as apart from the question whether any loan should be permitted, to consider more closely the durability than the desirability of the works or purposes for which the loan was required, and to use very considerable caution in fixing the period.

During the year 1910-11 the total amount borrowed by the Borough Councils from the L.C.C., or the central financial authority, was £335,436, and £77,343 was raised elsewhere under the Council's sanction; but these sums do not necessarily represent the total borrowings of the Councils. Of this £77,343, £51,054 was taken up from the Borough Councils' bankers, the loans being mostly subject to repayment at six months' notice; but they were loans made under the Council's sanction, and complying with the sanction as to periodical repayment by instalments. This method of borrowing is not regarded by the Finance Committee as altogether satisfactory, as in the event of a period of financial stress occurring the banks would probably exercise their options to call in the loans, and borrowers would then be compelled to raise money elsewhere to discharge their obligations to the banks. Further, from the point of view of economy, it is undesirable to give local authorities cause to look to other means of raising money, such as the issue of local stocks, short-term mortgages and debentures, or taking money on deposit.

The following table shows the loans sanctioned by the Council in the case of Metropolitan Borough Councils for the 10 years ended March 31st, 1911, for electricity undertakings (including meters and street lighting with electricity) and the electric wiring of consumers' premises, and providing electrical apparatus. The table does not include, of course, any loans sanctioned by Act of Parliament in respect of which the Council's sanction to the borrowing was not requisite, or loans sanctioned by the Treasury or the Local Government Board:—

1901-2	£577,998	1907-8	£275,518
1902-3	545,727	1908-9	184,905
1903-4	241,007	1909-10	129,580
1904-5	732,629	1910-11	183,325
1905-6	320,299		
1906-7	255,104	Total ...	£3,446,092

From this it will be seen that there has been a large decrease during the last few years, which observation applies to loans under all heads.

The net expenditure (charged to capital) on the electricity undertakings of Metropolitan Borough Councils up to March 31st, 1909, is as under :—

For Land	£229,990
Buildings (including furniture and fittings)	712,678
Plant and machinery...	1,653,658
Mains and services	1,939,934
Meters and indicators	175,008
Other items	1,399,552
Total	£6,110,820

It is necessary to explain that the large amount opposite "other items" includes £1,379,546 for purchase of goodwill, viz. :—St. Marylebone, £1,344,437 estimated cost of purchase of goodwill of undertaking ; Woolwich, £35,109 cost of goodwill ; total, £1,379,546.

The loans sanctioned by the Council from March 31st, 1909, to September 30th, 1911, in respect of the electricity undertakings of the Metropolitan Borough Councils amount to £432,994, which may for all practical purposes be apportioned as under :—

*Site and buildings...	£41,705	Generation £160,201
Plant (all plant at generating station, including accumulators, switchboards, &c.)	118,496	
Site and buildings for sub-stations ...	13,354	Distribution £272,793
Mains	174,325	
Plant (all plant at sub-station, viz., converting plant, transformers and switchgear)	25,067	
House services	41,028	
Meters	19,019	
Total	£432,994	

*It should be added that £13,450 of this sum was for the freehold of the Woolwich Borough Council's generating station "and adjoining property."

During the period covered by these loans, the general employment of metallic-filament lamps has had the effect of reducing the consumption of electricity, which has arrested the extension of electricity plant in some cases.

The fact is borne in mind that the London Electric Supply Act of 1908 transfers to the Council the powers of purchase previously vested in the several Borough Councils so far as regards the undertakings of most of the London Electricity Supply Companies, and, in addition, empowers the Council to purchase the undertakings, or parts of them, in the county, of those bulk supply companies which were not purchasable by a local authority. The powers of purchase may be exercised in 1931, or at subsequent periods of ten years. There remain just 20 years between now and the earliest date by which the Council could purchase the company's undertakings, and this period corresponds with the loan term allowed for generating plant. Consequently any loans sanctioned for such plant after 1911 will be in respect of plant estimated to last until after the Council is empowered to purchase the companies' undertakings, and if the option to purchase is exercised, the Council will then be the authority for supplying electricity in London side by side with the Borough Councils. The Committee taking a broad view of the present situation, and having regard to the developments of electricity supply in recent years, seems to think it preferable, so far as the financial aspect of the question is concerned, for Borough Councils where possible, as opportunity offers, to link up their undertakings for mutual support as well as for economy.

The Council has not up to the present expressed itself in favour of any definite policy to govern its actions as the sanctioning authority for loans for electricity purposes, having regard to the future development of electricity supply in London, and the possibility of the Council becoming the principal authority for the supply of electricity in or after 1931.

The duty of advising the Council as to the exercise of its powers under the London Electric Supply Act, 1908, rests with the Highways Committee, and it has been suggested to that Committee that they should consider whether it would not be desirable for them to recommend the Council to formulate a comprehensive policy as to the action which the Council should take in view of the 1908 Act. It is not suggested that at this stage the question of the exercise of power of purchase in 1931 should be considered, the immediate matter for deliberation being the development of all the various electricity supply undertakings in London.

The Committee is of opinion that, generally speaking, the relationship between the Council and the Metropolitan Borough Councils in regard to the sanctioning of loans is satisfactory, and that the action of the Council secures a wise and salutary supervision over the loan operations of the Councils in question.

Government Contracts (Fair Wages).—In the House of Commons Mr. Hodge asked the Home Secretary whether his attention had been called to an alleged violation of the Fair Wages clause by Messrs. Duncan Watson & Co., contractors for electrical work at Wormwood Scrubbs and Pentonville prisons, and whether he proposed to take any action in the matter. Mr. McKenna replied that he received a complaint of the nature indicated, and he had asked to be furnished with facts to substantiate it. When he received these he would make further inquiry, but he might say that the firm in question was not now doing, and had not for some weeks past done, any work for the prisons

THE BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION (INC.).

A MEETING of the Council was held at the Association's offices, 36, Kingsway, W.C., on 9th inst., at which the following firms were elected members :—The British Thomson-Houston Co., Ltd. ; the British Electric Transformer Co., Ltd. ; Messrs. Browett, Lindley and Co., Ltd. ; Messrs. Dick, Kerr & Co., Ltd. Messrs. Feld Bros. and Co,, Ltd., were elected Associates. We are informed that since the date of the Council meeting the secretary has received applications for membership by several important firms.

The secretary reported that the following gentlemen had assented to their election as Vice-Presidents of the Association :—S. Z. de Ferranti ; J. McDonald Henderson, M.P. ; Hugo Hirst, managing director, General Electric Co., Ltd. ; John Kerr, chairman of directors, Dick, Kerr & Co., Ltd. ; N. Kilvert, chairman, Lancashire Dynamo Motor Co., Ltd. ; C. A. Parsons, managing director, British Westinghouse Co., Ltd. ; O. H. Smith, director, British Thomson-Houston Co., Ltd. ; W. T. Stubbs, director, Electromotors, Ltd., President Manchester Chamber of Commerce ; G. A. Touche, M.P. ; Lord Vaux of Harrowden ; Douglas Vickers, director, Vickers, Ltd.

The following gentlemen were elected Vice-Presidents of the Association :—Sir Wm. Mather, Sir Andrew Noble, Sir C. A. Parsons, Mr. Alex. Siemens, Colonel Crompton and Lord Furness.

Reports from various Sub-Committees were considered and adopted, including that of the Sub-Committee on the Coal Mines Bill, under the recommendation of which the following letter was despatched to every Member of Parliament :—

COAL MINES BILL.

(As Amended by Standing Committee B.)

Clause 59, Section (2).

SIR,—I am directed by my Council to submit to you their views, with regard to Sec. (2) of Clause 59 of the above Bill, for which they respectfully claim your most serious consideration, having regard to the fact that this Association includes on its roll of members practically every important electrical manufacturing firm in the country, thus representing about £15,000,000 (fifteen million pounds) of invested capital, which gives employment to about 100,000 workmen.

My Council beg, first, to draw your attention to the Report of the recent Departmental Committee ("Electricity in Mines" [Cd. 5,498]) composed of the experts—R. A. S. Redmayne, Esq., Chief Inspector of Mines ; C. H. Merz, Esq., and R. Nelson, Esq., Electrical Inspector of Mines. These gentlemen found, *inter alia*, that—

"Electricity is to-day applied in one part of the country or another to every operation requiring mechanical power in and about a colliery ;"

"The feeling against the use of electricity in mines was largely based upon a vague fear due to lack of knowledge . . . . ;"

"Experience has shown that the proper use of electricity cannot be regarded as inherently unsafe . . . . ;"

"The number of fatal accidents due to the use of electricity in mines in one year has never reached a figure greater than 1·54 per cent. of the total number of fatal accidents in mines."

In view of these findings, and of the submissions hereunder, my Council find it difficult to understand how this Bill comes to contain a section calculated to have the most detrimental effect not only upon the whole electrical, but also upon the mining industry, by providing (Clause 59, Sec. (2)) : that should inflammable gas in air currents of mines exceed ½ per cent., the use of electricity shall be at once discontinued. My Council respectfully submit, as follows :—

1. That the safety of workers is already amply covered by Sec. (1) of Clause 59, which prohibits the use of electricity where, in the Inspector's opinion, such use would be dangerous to life.

2. That it is well-known that ½ per cent. of inflammable gas cannot be detected by the ordinary safety lamp in use in mines.

3. That this percentage of gas is not dangerous, as the Bill itself admits in Clause 66, Secs. (1) and (2), which provide that a place shall be deemed to be dangerous if the percentage of gas is found to be 2½ per cent. or upwards.

4. That, further, under the same Clause, Sec. (2) a mine may be worked with naked lights provided the percentage of gas does not exceed one and a quarter—which apparently goes to show that His Majesty's advisers regard a naked light as less dangerous than heavily-insulated electrical apparatus.

5. And, lastly, that the passing into law of Sec. (2) would manifestly be tantamount to a public condemnation, on the authority of the Legislature, of the general use of electricity as an exceptionally dangerous source of energy, heat and light.

My Council, therefore, respectfully claim your most serious consideration of the foregoing statement in the full confidence that, when the Bill comes up for its third reading, you will find yourself in a position strenuously to oppose, on all grounds of reason and justice, the placing of Sec. (2) of Clause 59, on the Statute Book.

D. N. DUNLOP, *Secretary.*

November 6th, 1911.

The report of the Sub-Committee on the model general conditions proposed by the Institution of Electrical Engineers recommending the transmission to the Institution of amendments was provisionally agreed by the Association.

In order to provide for the more prompt dispatch of ordinary and pressing business than was customary at the monthly meetings of Council, an Executive and Finance Committee of five members was elected. One of the immediate duties of this Committee will be to prepare for the annual general meeting (January) at which a new Council will be elected.

Applications for support from certain bodies desirous of projecting electrical exhibitions were considered, and the secretary was instructed to inform the applicants that the Council was unable to depart from the standing rule.

It will be of interest to those not yet working in the sectional groups to know that most of the important business of the Association (excepting matters of policy and questions affecting it as a whole) is conducted by these groups, which are at present as follows:—

A.—Arc lamps and carbons.
B.—Accessories (light, power and other electrical).
C.—Accumulators.
D.—Conduits and conduit fittings.
E.—Dynamos and motors.
F.—Fittings (including heating and cooking apparatus)
G.—Instruments.
H.—Meters.
J.—Incandescent lamps.
K.—Switchgear and controllers.
L.—Transformers
M.—Telephone, telegraphic and signalling apparatus, and primary batteries.
N.—Wires and cables.
O.—Engines (reciprocating, turbines, gas and oil engines).

Arrangements are in progress for the early meeting of each of the groups.

We are asked to state that the new offices of the Association at 36, Kingsway, W.C., afford good facilities, particularly for country members and their friends, for meeting and conducting correspondence. By the courtesy of the managers of the whole electrical secretary at an early date a bound set of his complete catalogues for reference by visitors from abroad.

In view of the fact that Mr. Hawes resigned the position secretary as from the 9th inst., and that Mr. Dunlop assumed full responsibility as on that date, members are asked to bear in mind that all correspondence should be addressed to the latter at 36 Kingsway, W.C.

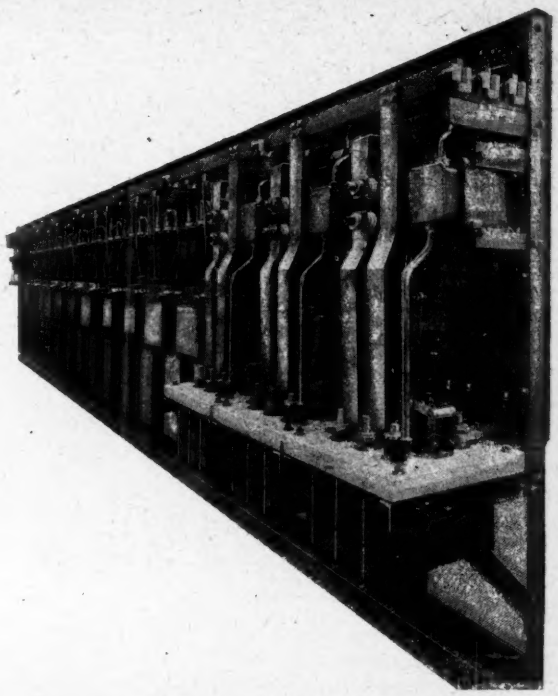

Fig. 3.—Back of Switchboard.

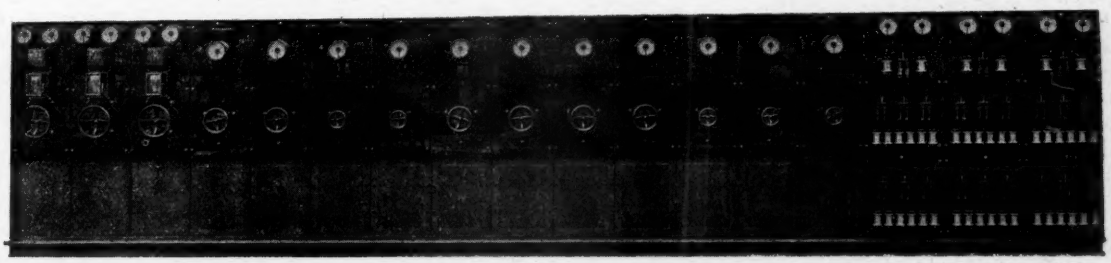

Fig. 2.—Front of Ferranti Switchboard in Textile Mill.

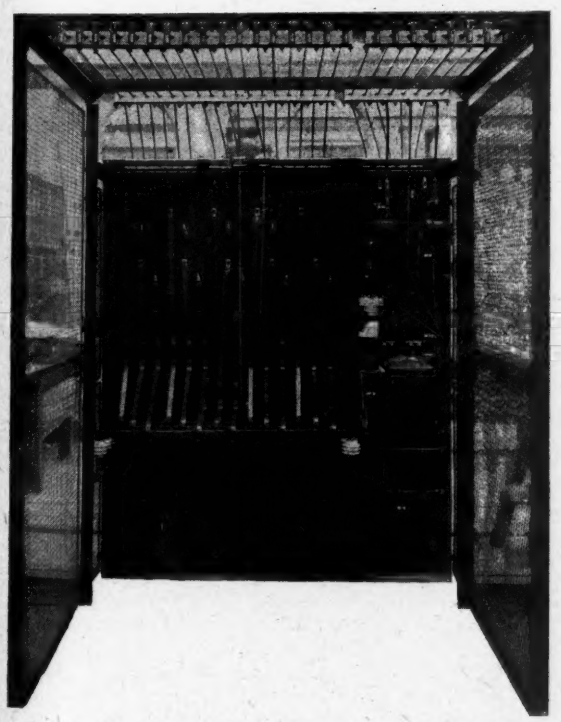

Fig. 1.—Bare Copper Connections between Cables and Switchboabd

and technical Press (with one exception) all the weekly papers are to be found on the table of the reading room.

Each member of the Association is requested to send to the

SWITCHBOARDS FOR TEXTILE MILLS.

The steady advance of electrical power in textile mills is well marked by the large number of boards supplied by Messrs. Ferranti, Ltd., to mills in Lancashire and Yorkshire. These boards bear a strong family likeness to each other, and are all for low-tension three-phase systems, of 40 or 50 cycles frequency.

A striking feature is their extreme simplicity. The even nature of the demand for power of a textile mill renders superfluous any protective device beyond overload instantaneous trip-coils on the switches. In one exceptional case, where all the power is taken from a supply company, and three transformers in parallel supply current to the board, overload and no-volt switches have been introduced.

The generator or transformer panels, in addition to the main oil switch and its accessories, usually contain only an integrating or indicating wattmeter and a voltmeter. The feeder panels are generally fitted with indicating wattmeters only. Lighting circuits are dealt with from a separate panel (situated at the end of the board), which is fitted with knife switches and fuses, enabling the distributing circuits to be connected between phases, or between each phase and the neutral, as the case may be.

Distribution of the power load is generally over a restricted network, and in consequence of this and the low voltage of supply, the generator and transformer panels have frequently to deal with very heavy currents, in some cases up to 5,000 amperes per phase. The construction of the switchgear is, therefore, very massive, and all the connections are heavy and liberally designed. They are kept as simple as possible, and care is exercised to give ample clearances between phases and all live parts and earthed metal.

The bus-bars and connections have frequently been made of aluminium to obtain increased contact surfaces, and this practice

has proved highly satisfactory, inasmuch as it has the twofold advantage of decreasing both weight and cost.

On account of the size of the cables, special arrangements have to be provided for neatly leading-up and adequately supporting them. In many cases the cables have not been taken to the board itself, but have been ended on the wall at the back, and bare copper rods or bars have then been taken overhead from the wall to the back of the board. An illustration of this arrangement is given in fig. 1, p 885.

Many of the mills appear to consider it unnecessary to provide a stand-by set, and only one generator panel is provided for on the board. Where a stand-by set is provided for, it generally takes the form of a transformer supplied from the mains of a local power company.

The panels are usually entirely of slate, or of slate with sheet-iron sub-bases. Marble panels do not appear to have found favour in this connection.

Our illustrations, figs. 2 and 3, show the front and back views of a switchboard supplied to a mill in the Stalybridge district.

THE TURIN EXHIBITION.

[BY OUR SPECIAL COMMISSIONER.]

The preceding article* was concerned with the British engineering exhibits. While it dealt with salient features, it did not, of course, exhaust them—among the omissions was that of a good collection of steamship models, fairly representative of what our big shipbuilding firms can do. Obviously one must leave to those journals concerned with other branches of industry, such subjects as photography, ceramics, textiles, furniture or printing.

In dealing with the exhibits of other countries, precedence must be given to the various Italian exhibits, which, as a whole, are indeed a revelation of the development of modern Italy. One has this exemplified again in the pavilion given to the province of Turin, which may be said to be the area of greatest technical industrial activity in the country.

As has been noted elsewhere in the pages of the Electrical Review, the inspiration of the electrical development of modern Italy has had its source in Switzerland, France and Germany. Names of big Continental firms familar enough to us in this country for their competition with our own firms in the British, Colonial and South American market are well to the front at Turin, exhibiting mostly through their Italian branches. For instance, the Tecnomasio Italiano Brown, Boveri, of Milan, showed a 3,500-H.P., 3,800-volt, 42-cycle turbo-alternator, running at the low speed of 504 R.P.M., together with a two-motor single-phase equipment for the Parma tramways. They also exhibited the most striking extra-high-tension switch in the Exhibition in the shape of a 100,000-volt 200-ampere switch with six breaks under oil, all in series. (The life history of the contacts and the oil in such a switch would be very instructive if it were made public in the form of an original communication to the *Proceedings* of the I.E.E. Some day or other such matters will be common knowledge. In its acquisition other than contact fingers will be burned.)

Messrs. A. and C. Fantini & Co., of Bergano, showed some decidedly good 65,000-volt switchgear. There was also a good example of a modern desk panel remote control switchboard, with push-button control of the operating solenoids. This type of control suffers somewhat in comparison with standard British and American practice of a knife-blade switch.

Among other large Italian generators was a 4,200-K.V.A., three-phase, 50-cycle, 6,400-volt turbo-alternator, with its direct-coupled exciter, by Franco Tosi, of Legnano. This firm also showed a 600-720-H.P. Diesel engine directly coupled to a Brown-Boveri alternator. The neat finish of the latter was very pleasing. Copper strip wound on edge is now common enough in British practice for field magnets, but one wonders when our firms will go further and finish off their work with the even, polished surface characteristic of the best Continental firms. One does not urge polish and appearance at the expense of sound construction, but a well-built machine is as worthy of pleasing finish as is a good book of a tree calf cover.

For the generating plant supplying light and power to the Exhibition in general the Societa Nazionale dele' Officine di Savagliano supplied a good seven-panel switchboard, up to date in all its details. Steam was raised in Babcock-type boilers supplied by Franco Tosi. The familiar Underfeed stoker was in operation here, as also a Babcock bucket conveyor.

Pelton wheels were well to the front; perhaps the best exhibits in the Italian section were those of Alberto, Riva and Co., of Milan, and of A. Calzoni, of Bologna.

The exhibit of the Italian Westinghouse Co. was a little disappointing, consisting almost entirely of light material.

Italian practice in electrical instruments had nothing very novel, but Messrs. Olivetti & Co., of Milan, made a good display of switchboard instruments, and current and potential transformers.

Messrs. Richard Ginovi, of Milan, showed some porcelain insulators for 100,000 volts working pressure and subject to 200,000 volts test pressure.

British inspiration is to be seen in the Vickers-Terni display of guns, armour plates and miscellaneous forgings, and also in the Ansaldo-Armstrong guns, and electric steering gear for a 7,000-H.P. turbine-driven destroyer. This also served to indicate the apparently extensive use of electricity in the Italian Navy. The 105-volt 1,400-ampere D.C. motors running at 450 R.P.M., for the steering gear were of a specially solid type. Generally, the Italian exhibits of models of merchant and warships were excellent, as also the display of automobiles and machine tools.

The type of three-phase overhead construction on the Italian State Railways was shown. The insulation is cut rather on the fine side, compared with British practice. Their more favourable climatic conditions are doubtless the reason.

Among Italian electro-metallurgical exhibits was the display of the Societa Metallurgica Italiano, who showed electrolytic copper, some excellently finished small brass articles, and copper and phosphor-bronze wire. The Italian metallurgical section was very good, some fine specimens of castings, forgings and riveted steelwork attracting special attention. This section was, however, weak in its descriptive matter and lack of attendants.

Among the Swiss exhibits, the Oerlikon, and Brown, Boveri displays were pre-eminent, while the Diesel engines shown by the Westinghouse Co., indicated the enormous popularity of this type of prime-mover on the Continent. Among the (in this country) less widely-known Swiss firms must be mentioned the Societa de Elettricita Alioth, of Munchenstein, who showed both E.H.T. switchgear and a number of single-phase traction motors. The most interesting of these was a 180-H.P., 3,500-volt, 15-cycle motor.

The German display was, of course, good, and varied. It suffered in comparison with the British display by its relative dispersion of the exhibits. The German Pavilion contained representations of the general industries, and was well situated.

General engineering exhibits were scattered in blocks in the various sections, while the electric railway exhibits were again in the railway pavilion. (Electric locomotives, German and others, will be described separately.)

The diversity of the German general exhibits was both interesting and suggestive. The sub-sectionalisation was inferior in attractiveness and organisation to that in the British Pavilion. The section devoted to the State activities in the protection of labour was particularly good in regard to consumptive sanatoria, a subject in which we are now imitating German policy after she has had several years' experience. Your Commissioner remembers visiting one such about 10 years ago, and being favourably impressed with the fact that workmen contributing to these had their minds rendered easy while they were under treatment by reason of the fact that their families were in receipt of adequate monetary assistance during the time of their separation from the general community.

* Electrical Review, Vol. 69, p. 688.

Passing from this section one noticed excellent examples of photographic and lithographic work. It was rather a shock to pass from paintings, lace and embroidery, to another section devoted to shells and the components of explosives. Cut glass and earthenware scarcely did credit to German potentialities in this respect.

Scientific and electromedical apparatus of neat design and good finish was the feature of an exhibition by Gebrüder Ruhstrat, of Göttingen, while E Laylold's Nachfolgen, of Cologne, exhibited mathematical instruments, Röntgen ray apparatus, spectroscopes, &c.

More war munitions were next encountered, the most interesting being a device for determining the velocity of a bullet or large projectile, together with the pressure due to the firing of the charge. The marine section was good, Schichau, of Danzig, showing numerous models of steamers, dredgers, hopper barges and war vessels. The German display of furniture was also good, but heavy in tone.

The United States pavilion was on the north bank of the river. The facade was distinctly imposing, but the building was very shallow. It contained numerous excellent photographs. The stands generally were unattended.

Interesting models and maps of the Panama Canal were shown. Other than photographically, the American engineering industries were practically absent. The Carborundum Co. had a stand (*all* exhibits thereon were described in English). The Jones & Laughlin Steel Co., of Pittsburg, showed steel spikes, wire, chains, bars and some tinned plates, *not* of exhibition finish. The Aluminium Co. of America showed aluminium in wire, sheet and ingot form. Another firm showed stoneware ducts. Quite apart from the fact that the glazing might be better, one would have expected it to be obvious to the manufacturers concerned that freight charges on bulky, breakable articles of this character would quite prevent a successful trade therein in Italy.

The French exhibits, on the other hand, were numerous, varied and well displayed. Not once had your commissioner a minute's difficulty in getting information or catalogues.

The Société pour Le Travail Electrique des Métaux showed a complete transformer sub-station, and also a set of accumulators for use on submarines; a very good working model of the automatic block signalling system, as used on the P.L.M. Railway, was showd by the Maison Müller, of Paris.

Messrs. Vedovelli Priestley & Co., of Paris, showed oil-break switchgear, porcelain and glass insulators, and gave displays of a short section of a line under 100,000-volt working pressure. Glass insulators were shown by Messrs. Charbonneaux et Cie, of Reims.

Another French display of high-tension accessories was that of La Canalizata Electrique, of Ste. Maurice. It comprised 10,000-volt three-phase oil-immersed fuses, 15,000-volt joint-boxes, 10,000-volt isolating switches, and 50,000-volt trifurcating boxes.

One special feature in the French metallurgical section was the models of electric furnaces and numerous samples of electric furnace products. There were models of a 5-ton Chaplet furnace, and also of Girod and Heroult furnaces.

Messrs. Marrel Frères showed some good heavy steel work, while the French aluminium producing concerns combined to put forward a collective display.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

TURKEY.—As the result of the imposition by the Turkish Government of a special extra duty of 100 per cent. *ad valorem* on all Italian goods imported, certificates of origin will be required for all goods entering Turkey, on and after November 1st, from any European country, all Mediterranean ports, and Morocco and Egypt. Goods unaccompanied by such certificates will be regarded as of Italian origin until proof to the contrary is afforded.

The certificates, which may be endorsed on invoices, must state the country of production or manufacture of the goods. They must be legalised by the "Commercial Tribunal" (Chamber of Commerce) or municipal or police authority at the place of residence of the shipper, or by the Customs authorities at the port of shipment, but need not be legalised by Ottoman Consuls. If the certificates are not endorsed on invoices, they must be drawn up on the official forms of the authorities named. Certificates must be presented at the Customs House of importation with the original invoices and the Customs declarations.

AUSTRALIA.—The Commonwealth Customs authorities have issued the following decisions as to the duties to be levied on certain electrical and similar goods. The rates quoted are those leviable under the Preferential Tariff applicable to British goods.

Asbestos wood (ebony or plain) in sheets 3 ft. × 4 ft.	
Used for mounting electrical instruments ...	15 %
Shunt coils, imported separately for arc lamps ...	Free
Watkin switch	20 %
Telephone distributing frames; relay or condenser racks; meter racks; coil racks, of metal ...	25 %
Cinematographs...	25 %
Electric carpet sweepers	25 %
Motor horns, Klaxon, electric...	30 %
Magnet wire, copper, black enamelled (used in connection with wireless telegraph instruments)...	Free

Electricity in Australia: Agricultural and Industrial Needs.—There has recently been considerable talk of extensive electrification work in the vicinity of Melbourne for railway, tramway and power purposes, and there is little doubt that in the near future something important will be effected in this direction. The *Melbourne Age* recently pointed out how magnificent such work may be from an agricultural point of view:—"The wheat lands of Victoria are not very rich in nitrates, and that is largely why their average yield per acre is so far below the yield of the American wheat lands, where nitrates are more abundant. These wheat lands are also somewhat deficient in phosphoric acid. Victorian farmers have already begun to fertilise in a small way, but so far they have confined their efforts to making good the phosphoric deficiency. That, however, is only half the battle, and the least important half. Nitrates are the most acutely essential factor in successful wheat production, and if farmers had available a good cheap nitrogenous manure they could assure themselves wheat crops of a richness beyond their present dreams. The question is, How can they get such a fertiliser?"

"Superphosphates are fairly cheap, but it is very different with nitrates, the price of which is virtually prohibitive. It is no exaggeration to say that if it were possible for Victorian farmers to obtain good nitrates at about the present price of superphosphates, the wheat production of this State would very soon be trebled in volume and in value. This can be done, and with the greatest ease, by means of the electrification of the Melbourne train and tramway service. Railway and tramway electrification will require the installation of a great State-owned electric power plant in or near Melbourne. This enterprise will necessarily entail the acquisition by the State of the requisite power, and provide an ideal opportunity to establish an electro-chemical industry in the farmers' interest. The atmosphere is the great main source of nitrogen, and the only means of fixation to render it serviceable for agricultural purposes is electric power. Wherever electric power is cheaply available nitrates can be manufactured at a minimum of cost."

In Victoria nitrates could be made in large quantities at a particularly low cost, because the work could be carried on at periods of light load. "Experts calculate that the electric power station which will be required in Melbourne for the trams and trains will have enough electric power to spare in periods of light load to produce a sufficiency of nitrate fertilisers (including nitrolim) and of calcium carbide (for acetylene gas) and carborundum (to take the place of emery) to supply the needs of all Australia. It is estimated, moreover, that the nitro fertilisers and the calcium carbide can be produced so cheaply that the Government will be able to put them on the market at the price of £6 and £7 per ton respectively, and still make a substantial profit. What this means to the rural population generally will be appreciated at a glance. The current retail price of nitrate of soda is £13 10s. per ton, and of sulphate of ammonia £15 per ton. These are the two most used nitrogenous fertilisers. If supplied at £6 per ton to our farmers, the very poorest would be able to manure their lands in a scientific way and double, treble and even quadruple the present fruits of their industry." Calcium carbide supplied at £7 per ton would reduce at one blow the farmer's lighting bill by more than 50 per cent., and give the Victorian agricultural producer one of the best and cheapest lights in the world.

It is further pointed out that when the Australian Government begins to deal with electrification it should build a power plant capable of benefiting the country as well as the city, and the station should be constructed also with a view to the possibility of steel and iron smelting at a later date.

China.—The German Consul at Hong Kong states, with regard to the outlet for electrical goods there, that electric fans are mainly supplied by the English General Electric Co., while German makers fail to find an entrance owing to high prices Lighting apparatus in general is chiefly supplied from England and Germany, tantalum and Osram lamps being most in demand. In 1910 of the aggregate imports of 463,000,000 Haikwan taels, electrical material figured for 1,387,000 taels, an increase of 23,000 taels on the imports of the previous year.—*Elektrotechnische Zeitschrift.*

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

24,584. "Electric light fittings." W. J. HOLLICK. November 6th.

24,595. "Incandescent electric lamp." W. F. MELHUISH. November 6th.

24,601. "Electric clock." D. BURNS and F. G. COUCH. November 6th.

24,666. "Insulated wire or cable for electrical purposes." A. J. FAULDING. November 6th.

24,668. "Electrically-operated portable vacuum cleaners and the like." W. SCHMAHL and MAGIC APPLIANCES, LTD. November 6th. (Complete.)

24,674. "Devices and appliances for the purpose of mechanically or electrically operating and manipulating tram and other permanent way points, switches, signals and the like from cars while in motion." W. G. BOONZAIER. November 6th.

24,685. "Means for providing electric light for cycles, motor-cycles, motor-cars and like vehicles." F. VON MADALER and R. H. MORTEN. November 6th. (Complete.)

24,697. "Means for use in automatically controlling the timing in magneto-ignition apparatus." H. DIEHL. (Convention date, November 26th, 1910, Germany.) November 6th. (Complete.)

24,724 "Electric and other internally heated flat irons and the like." J. E. POWNALL. November 7th.

24,730. "Supports or carriers for the globes surrounding incandescent gas lamps, electric lamps and the like." R. HUGHES. November 7th.

24,743. "Electro-deposition of metals and their alloys." C. A. OWEN and R. FLETCHER. November 7th.

24,744. "Buffer machines used in connection with electrical circuits." SIEMENS SCHUCKERTWERKE G.M.B.H. (Convention date, November 8th, 1910, Germany.) November 7th. (Complete.)

24,745. "Controlling apparatus for electrical lifts." A. W. PENROSE AND Co., LTD., and F. BARLOW. (Addition to No. 1,335, 1911.) November 7th. (Complete.)

24,760. "Electrical precipitation of precious metals from solutions containing same." H. PEARSON. November 7th.

24,761. "Magneto-electric machines for combined ignition and illumination purposes for motor road vehicles." F. R. SIMMS and SIMMS MAGNETO Co., LTD. November 7th.

24,775. "Magnetic clutches." A. T. COLLIER. November 7th.

24,778. "Electrically-operated motor vehicles." CROMPTON & Co., LTD., J. C. MACFARLANE and H. BURGE. November 7th.

24,779. "Electric regenerative control apparatus and systems." CROMPTON AND Co, LTD., J. C. MACFARLANE and H. BURGE. November 7th.

24,787. "Miners' electric safety lamps." O. OLDHAM. November 7th.

24,807. "Circuit connection for private telephone installations connected to telephone exchanges." SIEMENS BROS. & Co., LTD. (Siemens & Halske Akt. Ges., Germany.) November 7th. (Complete.)

24,823. "Means for increasing the power-factor and overload capacity of alternating-current asynchronous machines." G. KAPP. November 7th.

24,838. "Miners' safety lamps." W. L. AVERY. November 8th.

24,847. "Electric heaters." A. S. BLACKMAN and S. R. WINDLE. November 8th.

24,933. "Electrically-heated devices particularly applicable to soldering irons and the like." EVERSHED & VIGNOLES, LTD., S. EVERSHED and W. CLARK. November 8th. (Complete.)

24,935. "Electrical machine for taking a graphical record of the notes played on a piano or organ." E. T. ILLING. November 9th.

24,941. "Sparking plugs." A. E. FLETCHER. November 9th.

24,942. "Electrical overhead gear strainer and like insulators." BRITISH INSULATED & HELSBY CABLES, LTD., and J. W. ASTLEY. November 9th.

24,970. "Means for use in automatically regulating the timing in magneto-ignition apparatus." H. DIEHL. (Convention date, November 9th, 1910, Germany.) November 9th. (Complete.)

24,977. "Alternating current electromagnets." R. H. BARBOUR. November 9th.

25,044. "Circuit arrangements for alternating current galvanometers." H. ABRAHAM and J. CARPENTIER. (Convention date, November 12th, 1910, France.) November 10th. (Complete.)

25,050. "Electric switches." F. L. ANDERSON. November 10th.

25,086. "Electrical measuring instruments." G. NORTH. November 10th.

25,087. "Electrical measuring instruments." G. NORTH. November 10th.

25,091. "Apparatus for heating water or other liquid by means of electricity." SOC. ANON FABRIEK VAN INSTRUMENTEN EN ELECTRISCHE APPARATEN INVENTA. (Convention date, July 20th, 1911, Belgium.) November 10th. (Complete.)

25,108. "Means for heating liquids by electricity." C. J. MONTGOMERY. November 11th.

25,109. "Dynamo-electric machinery." LANCASHIRE DYNAMO AND MOTOR Co., LTD., and H. C. S. DDELEY. November 11th.

25,138. "Lighting and regulating of electric arc lamps." HARLE ET CIE. (Convention date, November 12th, 1910, France.) November 11th. (Complete.)

25,157. "Perforating apparatus for telegraphic apparatus." E. BELIN. (Divided application on 9,556/1911, April 19th.) November 11th. (Complete.)

25,158. "Automatic resistance regulators for telegraph lines and the like." E. BELIN. (Divided application on 9,556/1911, April 19th.) November 11th. (Complete.)

25,161. "Means for use in automatically regulating the timing in magneto ignition apparatus." H. DIEHL. (Convention date, November 23rd, 1910, Germany.) November 11th. (Complete.)

25,164. "Incandescent electric lamps or the like." C. E. S. MCCANN, S. R. SKELLORN and S. COOPER. November 11th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1910.

PROTECTIVE DEVICES FOR ELECTRIC DISTRIBUTION SYSTEMS. British Thomson-Houston Co. and J. Whitcher. 17,177. July 19th.

ELECTRIC SWITCH CONTACT DEVICES FOR LOWERING GEARS FOR ARC LAMPS. O. R. W. Williams and J. Stevenson. 24,294. October 20th. (Patent of Addition not granted.)

DETERMINATION OF LOW VOLTAGES IN ELECTRIC CIRCUITS. Cambridge Scientific Instrument Co. and W. S. Peake. 24,457. October 21st.

ELECTRIC STRIKING AND CHIMING MECHANISM. I. H. Parsons and A. E. J. Ball 24,538. October 22nd.

REGULATING SWITCHES FOR ELECTRICAL CURRENTS. C. W. Bailey. 24,858. October 26th.

REGULATING DEVICES FOR ELECTRICALLY-ACTUATED AIR AND LIKE FLUID COMPRESSORS. Westinghouse Brake Co. (Westinghouse Air-Brake Co.) 24,912. October 27th.

REGULATION OF DYNAMO-ELECTRIC MACHINES. Soc. Anon. "Phi" 25,026. October 27th. (August 6th, 1910.)

ELECTRIC SWITCHES. Spagnoletti, Ltd., and V. E. Joyce. 25,076. October 28th.

CONNECTOR FOR ELECTRIC CABLES. H. R. Doel and A. E. Clarke. 26,124. November 10th.

PARTY-LINE TELEPHONE SYSTEM. E. Bowman. 26,440. November 14th.

FASTENER FOR LIDS OF TRAIN-LIGHTING ACCUMULATORS. W. N. Cochrane. 26,696. November 17th.

ELECTRIC VAPOUR LAMPS. R. Ritzmann, M. Wolfke and F. Lissy. 27,163. November 22nd.

ELECTRIC SIGNS. P. C. Watmough. 27,981. December 1st.

ELECTRIC CONNECTIONS AND FOCUSSING ARRANGEMENT FOR ELECTRIC MOTOR LAMPS. C. H. Worsnop. 28,457. December 7th.

1911.

CONTACT PINS FOR INTERRUPTERS FOR ELECTRIC CIRCUITS. Firm of Robert Bosch. 72. January 2nd. (February 11th, 1910.)

SPARKING PLUG. Officine di Villar Perosa Agnelli & Co. 1,562. January 20th. (June 2 th, 1910.)

SYSTEMS FOR TRANSMITTING SIGNALS ELECTRICALLY THROUGH CONDUCTORS. F. Fisher. 2,686. February 2nd. (February 3rd, 1910.)

MAGNETIC COMPASSES. E. H. Clift. 3,404. February 10th. (Cognate application, No. 13,203 of 1911.)

AUTOMATIC TELEPHONE SYSTEM SELECTORS. F. R. McBerty. 3,452. February 10th. (February 10th, 1910.)

ELECTRIC LAMPHOLDERS. W. Leonard. 3,746. February 14th.

METHOD OF STARTING AND REGULATING THE SPEED OF ALTERNATING-CURRENT MOTORS. A. Heyland. 4,627. February 23rd. (February 24th, 1910.)

INSULATING MATERIAL. British Thomson-Houston Co. (General Electric Co.) 5,165. March 1st.

ELECTRIC CONDUCTORS. Ges. für Elektrotechnische Industrie. 5,569. March 6th. (June 28th, 1910.)

PUSH-BUTTON ELECTRIC SWITCHES. Hartmann & Braun Akt.-Ges. 6,147. March 11th. (April 12th, 1910.)

X-RAY TUBE. S. Tousey. 7,067. March 21st.

ELECTRICITY METERS ACCORDING TO THE FERRARIS PRINCIPLE. M. Strelow. 8,032. March 30th. (March 30th, 1910. Addition to No. 21,240 of 1910.)

ELECTRO-MAGNETICALLY OPERATED COLLECTORS FOR ELECTRIC RAILWAYS. H. W. Sheehy. 11,740. May 15th.

ELECTRIC ARC LAMPS. Siemens Bros. Dynamo Works. (Siemens & Schuckertwerke Ges.) 14,127. June 14th.

ELECTRICALLY-HEATED VESSEL. H. Mieth. 14,222. June 15th.

DEVICE FOR OPERATING OR CONTROLLING ELECTRIC SWITCHES AND THE LIKE FROM A DISTANCE. J. L. Odgers. 14,704. June 21st.

EXPERIMENTAL APPARATUS FOR INTUITIVE ELECTRIC INSTRUCTION. G. Bache. 14,999. June 27th.

APPARATUS FOR THE STERILISATION OF MILK, BEER, WATER OR OTHER LIQUIDS BY MEANS OF THE ULTRA-VIOLET RAYS. W. R. Walkey. 16,110. June 12th.

ELECTROMAGNETICALLY OPERATED SWITCHES. C. B. Larzelere. 17,142. July 21st. (August 2nd, 1910.)

CURRENT TRANSFORMER FOR HIGH VOLTAGES. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 17,208. July 27th.

ELECTRICAL CONTACT DEVICES FOR USE WITH MOVING CONDUCTORS. O. S. Schairer. 17,481. August 6th. (August 6th, 1910.)

DYNAMO-ELECTRIC GENERATORS. G. Inrig and Gavan Inrig, Ltd. 20,904. September 21st. (Divided application on No. 28,754 of 1910. May 2nd.)

ELECTRICAL SWITCHES. A. Stephenson. 463. January 7th.

ELECTRIC LIGHTING SYSTEM. E. M. Fitz. 2,727. February 2nd.

ELECTRICALLY-OPERATED SIGNS AND THE LIKE. A. D. Hecht and J. S. Dowdell. 4,521. February 27th. (Cognate application, No. 18,265 of 1911.)

CARBON-HOLDER FOR DISTRIBUTORS OF ELECTRICAL IGNITION MACHINES. A. G. Bloxam. (Firm of Robert Bosch.) 8,224. October 1st.

ELECTRIC FURNACES. W. E. Lake. (J. E. Florence.) 8,998. April 11th.

ELECTRIC INCANDESCENT LAMP. O. Schaller. 9,719. April 21st. (April 21st, 1910.)

REFLECTORS FOR INCANDESCENT ELECTRIC LAMPS. E. Booth and N. R. Booth. 9,806. April 22nd.

ELECTRIC CAPACITATIVE INDUCTIVE COUPLINGS. J. Schiessler. 13,963. October 12th. (Divided application on No. 24,696 of 1910, October 24th.)

ELECTRICAL TERMINALS. A. P. Lundberg, G. C. Lundberg and P. A. Lundberg. 16,514. July 18th.

HIGH-TENSION DISTRIBUTORS FOR ELECTRICAL IGNITION SYSTEMS FOR INTERNAL-COMBUSTION ENGINES. F. H. Royce and Rolls-Royce, Ltd. 17,204. July 27th.

TERMINAL CLIPS FOR ELECTRIC WIRES. J. H. Kaesen. 18,575. August 14th.

DEVICE FOR SHORT-CIRCUITING THE CURRENT OF MAGNETO-ELECTRIC IGNITION APPARATUS. Firm of Robert Bosch. 19,233. August 28th. (May 15th, 1911.)

PROTECTIVE DEVICES FOR ELECTRIC DISTRIBUTION SYSTEMS. British Thomson-Houston Co. and J. Whitcher. 21,662. October 2nd. (Divided application on No. 17,177 of 1910, July 19th.)

British Trade Failings in Turkey.—"The key-note of recent British Consular reports is, that owing to obsolete methods, our trade is not holding its own against the aggressive activity of our commercial rivals. The great failing of the British manufacturer would seem to be the lack of adaptability to the needs of his customer—and the sooner this is remedied the better. The necessity for direct representation, and more particularly the advantage of sending regular commercial travellers to this part of the world, cannot be too urgently impressed upon British firms, if they are to compete with our rivals in supplying the increasing demands of the country in every branch of trade."—*Journal of the British Chamber of Commerce in Turkey.*

A Dutch Tramway Contract.—It is reported from Mastricht that the A.E.G. has accepted the conditions imposed by the Dutch Government in regard to the construction of a tramway from Mastricht to Vaals. This is considered to represent the completion of the transaction.